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H. W. Warrington.

New York.
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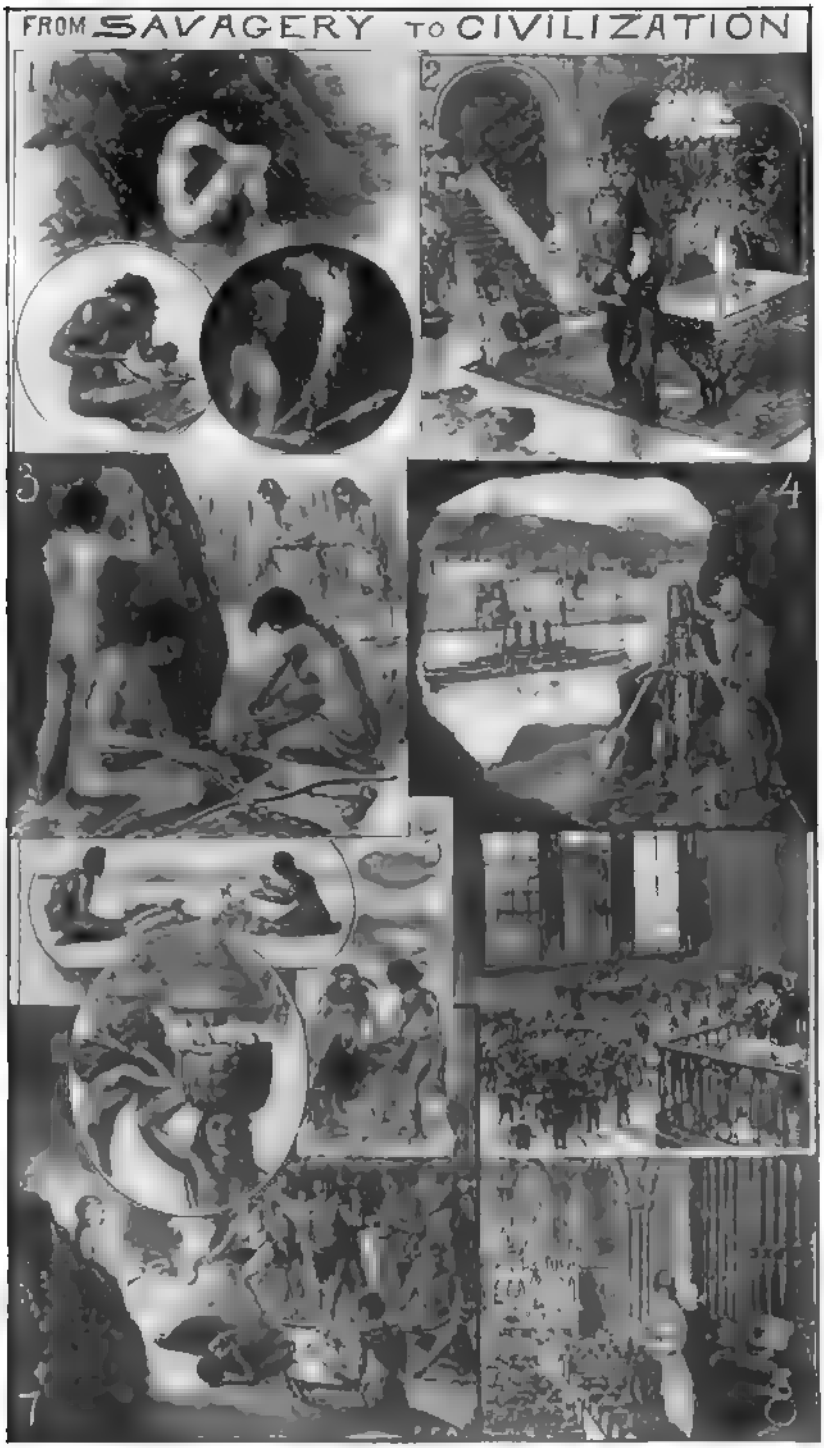

CONTRAST OF PAST AND PRESENT, ILLUSTRATING PROGRESS AND PROSPERITY.

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3-4. INDUSTRIES, MEANS OF OFFENSE.

5-6. BUSINESS, BUILDING, COMMUNICATION.

7-8. WORSHIP AND MUSIC.

PROGRESS AND PROSPERITY

THE OLD WORLD AND ITS REMAKING INTO THE NEW — THE STORY OF THE MEDIUMS OF DEVELOPMENT — THE BUILDING OF EMPIRES IN AMERICA, THE WORLD'S WONDERLAND

BY

WILLIAM DeHERTBURN WASHINGTON

ASSOC. MEM. AM. SOC. C. E., ETC., ETC.

OVER TWELVE HUNDRED ILLUSTRATIONS

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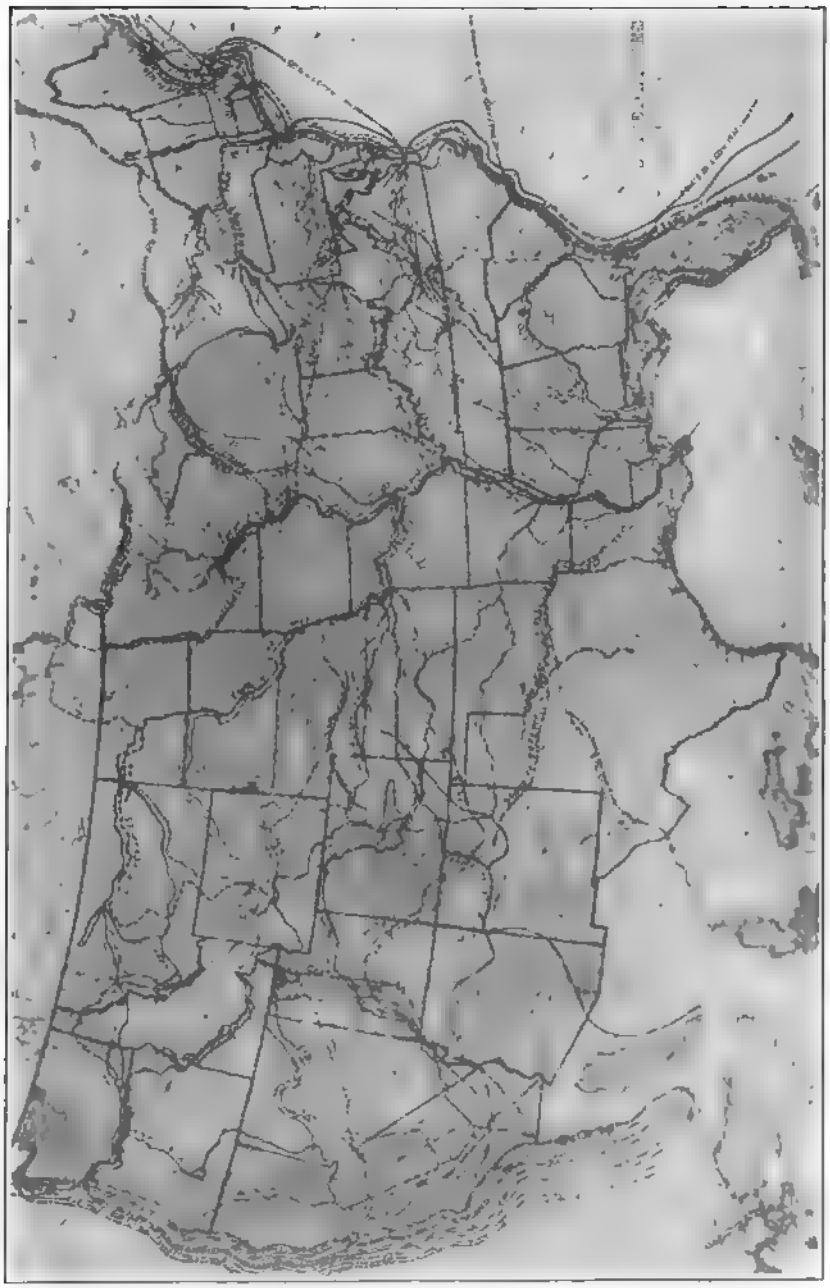
This Book
is
Affectionately Dedicated
to
The Memory
of
My Father and Mother



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ERRATA.

In a work of this character containing many figures, dates, and calculations, it is almost impossible to escape errors of one kind or another, owing to the fallibility of author, copyist, type-setters and proof-readers. The following have already been noted and both author and publishers will be grateful to have any others called to their attention for correction in future editions.

P. xx, line 16, for *FUTURE* read *PRESENT*.

P. 165, caption of illustration, for *30 miles* read *23 miles*.

P. 196, 3 lines above cut, for *undergrounded* read *ungrounded*.

P. 272, 2 lines above illustration, for *12,144,000* read *1,214,400*.

P. 331, 3 lines below illustration, omit *Central of*.

P. 428, in caption of illustration, for *Glasgow* read *Cheshire*.

P. 436, in caption of illustration, for *boat* read *ship*.

P. 477, line 12, for *Phineas* read *Phileas*.

P. 512, in caption of cut, for *Tram Car Paris* read *Tram Car London*.

P. 538, 4 lines from foot, for *tone* read *ton*.

P. 568, 3 lines above illustration, for *Tacua* read *Tacna*.

P. 573, line 7, for *Haiti* read *Haitien*.

P. 589, to fourth line from foot, add, *except the Post Office*.

P. 675, in caption of illustration, for *40,000 horsepower* read *4,000 horsepower*.

P. 870, in caption of illustration, for *400-ton* read *425-ton*.

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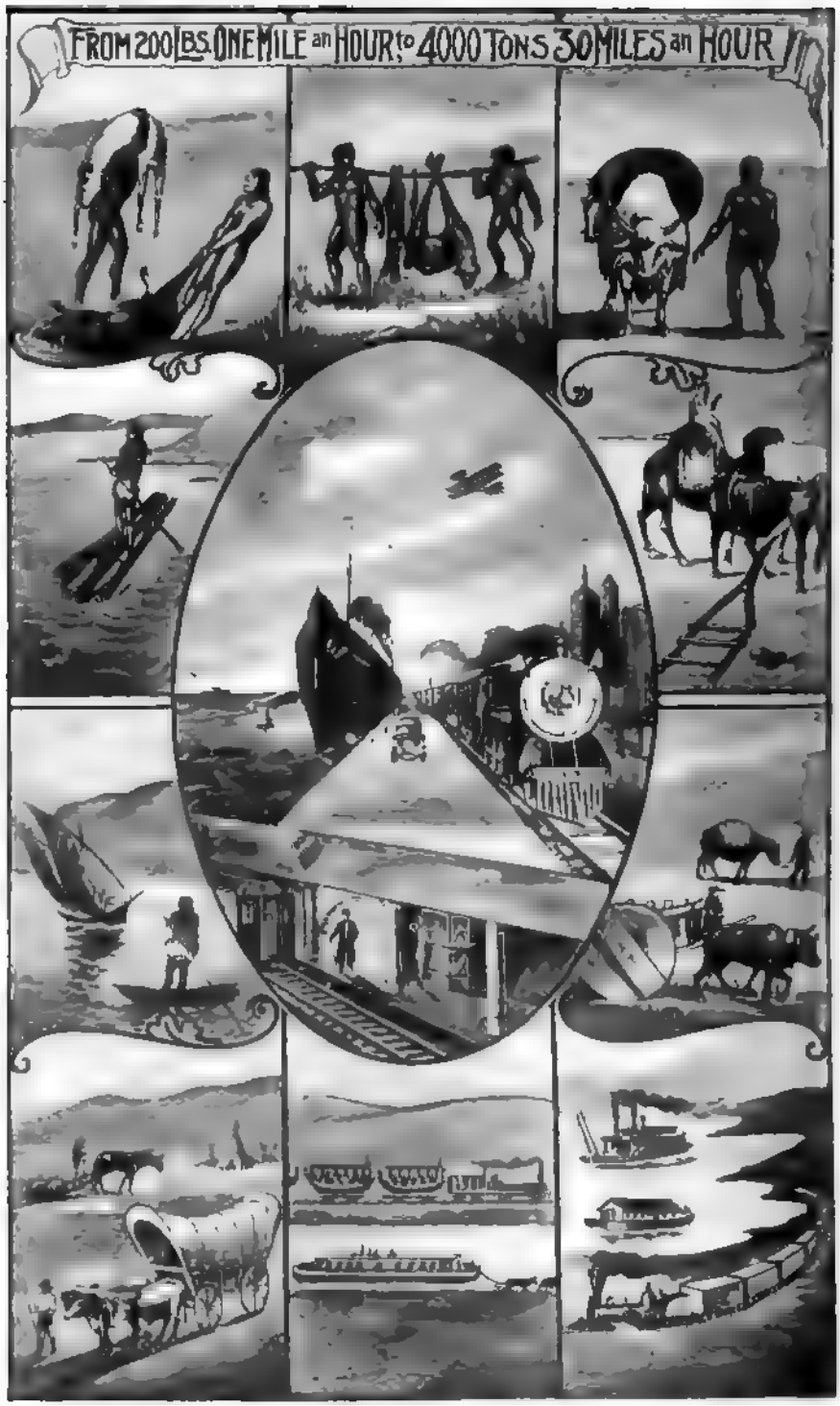


MAN'S REAL PROGRESS AND PROSPERITY BEGAN WITH THE TRANSFERENCE OF HIS BURDEN FROM MUSCLE TO METAL.

MAN SHELTERLESS, NAKED AND COMFORTLESS

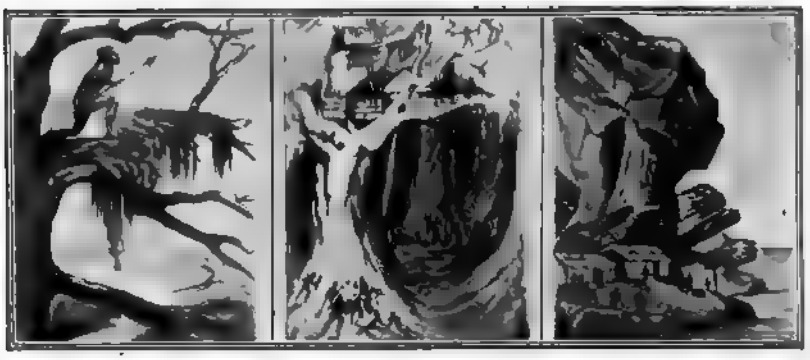
BEFORE PROGRESS AND PROSPERITY BEGAN

FOREWORD.

Character and Purpose of the Work.

A Field Never Covered.

The progress of man has been viewed from many angles. Darwin and Haeckel have traced him as the animal; Romanes, the development of his mentality; Spencer, of his morals; Caird, of his religion. His political history has been recounted by thousands. But what seems of inestimably greater importance to us to-day, the story of his material civilization, progress and prosperity, has never been adequately set forth by either the evolutionist or the historian.



CRUDE TREE DWELLING. LATER TREE DWELLINGS. DWELLINGS UNDER ROCKS.

Distinct From History.

Until recently, history has been written from either the spectacular or biographical point of view. It was either the description of battles, catastrophes and political intrigues, or the gossip of courts and palaces.

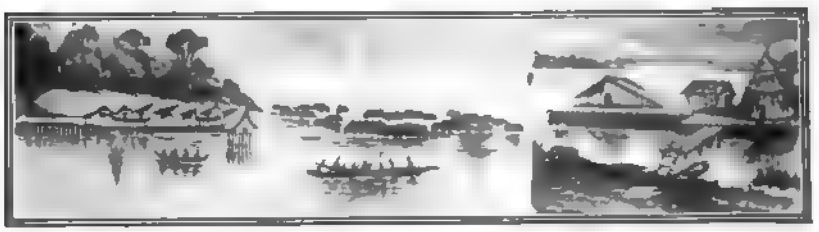
In the days when the king was the state, his lightest word was thought more worthy of record than the life of the people. Yet of what practical value to us is the study of the excesses of the Caesars or the luxuries of the Bourbons?

What we need to-day is not the memoirs of princes, however great or small, but the overshadowing story of what man has accomplished and can accomplish individually and collectively.

This work has been written in the belief that the story of man's progress and prosperity constitutes a real romance more fascinating than fiction, and of great intrinsic and practical value to both our personal and civic welfare.

Of Human Progress.

In following our story, we shall not deal, as did the evolutionists, with prehistoric and necessarily theoretical and hypothetical data. In fact, much of their work has been preliminary intellectual reconnaissances into man's unknown and uncertain past. We will endeavor to write of man's human, rather than his natural, evolution. His natural development largely wrote itself; his human development has been largely of his own creation.

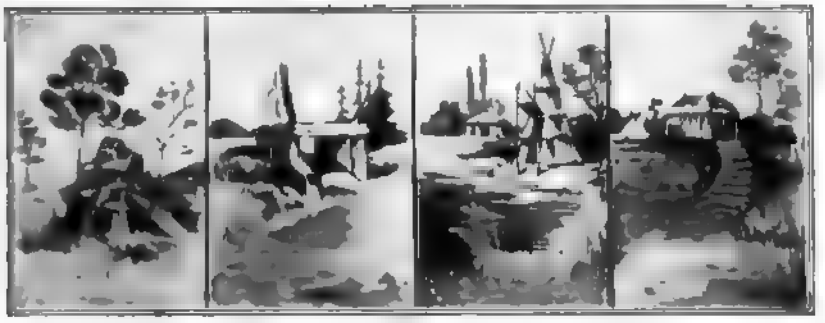


PREHISTORIC LAKE DWELLINGS.

Being and Living. Darwin dealt with the struggle of man for mere existence. We will endeavor to deal with man's slightly less strenuous though momentous struggles for better surroundings, greater comfort and knowledge, and to discover the most important agencies whereby he has achieved progress, mental, moral and material.

The meaning of evolution, in the minds of many, has been hidden in a hoary haze of science, but the word evolution, in its cardinal sense, means simply development. Huxley says it is a history of the steps by which man has risen from lower to higher planes, of those things which have made the world and man what they are.

The Age of Achievement. Drummond calls this the age of the evolution of evolution. Let us simplify and call it the age of the realization of man's development. Let us see if we can discover the machinery, the tools and forces, by which man has shaped his living world in the lathe of time, and see if the same practical tools, sharpened by knowledge, will not cut a still smoother passage for him and advance him still more rapidly and surely on the road to progress and prosperity.



PREHISTORIC ARTIFICIAL CAVE AND REED HABITATIONS

Our Subject. Ours is the story of the ascent of man from his primitive state, when he was a pigmy, the plaything of nature and with strength far inferior to that of the beasts, until to-day, when he has become a giant who has conquered earth, water, air and ether, when he is able to exert a power greater than a hundred thousand men of yore, when a single man can direct forces that will move a load a greater distance in a day than a million men can carry it.

We believe it will be found that we have covered a very broad field, and collected a vast amount of useful information, hitherto not readily available.

A few of the many interesting matters with which we deal in the development of our subject are:—

A Few of Our Topics. The old world and its remaking into the new; the progress of nations, and the forces that have made for their advancement, the greatest revolution in the world, our own times with their wonderful achievements; the veins and arteries of the world, the me-

diums of modern magic; the development and progress of the western hemisphere; the winning of the west; the making and building of empires; America the world's wonderland; the coming golden age of the world

CLIFF PALACE, MESA VERDE, COL

We have followed man's means of movement, both ancient and modern, on both land and sea. In the case of the railroads, we have gone into detail, which is necessitated because of their importance as the foremost agents of land transportation and of modern progress and prosperity.

Simple and Untechnical.

Ruskin has said, "The greatest thing the human soul ever does is to see something and tell what it saw in a plain way."

The writer will endeavor to make the story of progress and prosperity simple and, he hopes, interesting and instructive to the reader.

We will tell our story not only simply, but tersely, in brief paragraphs, so as to enable the busy man to grasp at a glance the essence of many facts.

Shoulder Notes.

We have inserted shoulder indexes in prominent paragraphs, so as still further to leaven our narrative, and have used frequent cross-heads for the purpose of emphasizing significant facts, and separating the topics of our story, all in order to make the matter of the book more easily available for the rapid reader.

A Thousand Illustrations.

We have depended not alone upon the written word, but have appealed to the eye to aid the understanding Over twelve hundred illustrations are used to vivify our pages. These are in many cases from drawings made especially for this work, in other cases from rare originals, both ancient and modern, contemporary with the subjects they are used to illustrate, and are the result of a

search extending over many years. On a number of subjects we believe they constitute the most complete collection in existence. It is only through such illustrations, re-creating the past and contrasting it with the present, that we can properly picture and fully realize the progress of man, and the tremendous changes that separate even the recent past from the living present.

For the Good of All.

This book is written first and last for the ninety-million people of the nation, who are vitally concerned in the healthful condition and expansion of their own and the nation's industries.

In undertaking the work, the writer was actuated by a sense of public spirit, akin to good citizenship, and it is his sincere hope that it will aid in bringing about a clearer understanding of the fundamental factors for the creation and preservation of our progress and prosperity.

MAN'S EARLIEST MEANS OF MOVING HIS NECESSITIES

SECTION I.

THE ESSENTIAL FORCES MAKING FOR MAN'S PROGRESS AND PROSPERITY.

Movement.

Finite or Infinite.

It is the revolution of the earth that gives us night and day and makes both sides of the world inhabitable, else one side would be forever dark, cold and useless It is the movement of the earth, we are told, that keeps it from being drawn into the sun and consumed.

It is the unseen movement of evaporation, and the visible precipitation of water which give us rain to fructify the earth.

Movement.

It is the passage of the sap, freighted with the substances that carry nutrition to each blade of grass and tree, that gives life and growth to vegetation, without which there could be no animal existence.

It is the circulation of the blood, freighted with tissue-building substances carried to the remote parts of the body, that preserves and develops animal life.

Life and Death.

In short, movement represents the difference between action and desuetude, between life and death. No amount of thought or intelligence; no amount of cultivation or refinement would ever have effected anything without it.

The conception must be transformed into definite action by movement to become a physical entity. In fact, there can be no cause and effect, change, improvement, development and activity, without movement.

Hence, the first law of life is the law of motion. The heart and lungs must expand and contract, and the blood must circulate to sustain vitality. To maintain these conditions, man must obtain food and fuel, and thus more complicated and extended movement becomes essential. Man, of necessity, must become a locomotive creature.

Psychology. Spencer, in his "Principles of Psychology," shows that the slowest moving animals are those with the least brain. The tortoise and other slothful creatures are of the lowest intelligence. Below them in the scale of life are those shell-fish which lack ability to move voluntarily, and have no intelligence whatever.

Stagnation. Can we imagine a modern world of isolated individuals or families? How could there be development of the arts, commerce and trade and that specialization of industry which has emancipated the individual from the necessity of himself supplying his every want?

It seems an entire denial of the truism that in unity is strength, and makes us take the position that the unit or the individual can be greater than the whole or the nation, of which the former is only an infinite part.

PREHISTORIC POLE CARRIAGE. MAN'S BURDEN TRANSFERRED FROM HIS OWN BACK TO THE ANIMAL'S

The Great Agency. The means and agency which could and did bring about this change seem to represent the most important and positive influences that have ever had bearing upon mankind

Of all the animals, man alone has been able to increase the rapidity of his movement by borrowed and artificial means. The mammal can still move only as fast as its limbs will carry it, the bird as its wings. To man alone has it been reserved to improve

upon nature's provisions both by bringing other animals under his power and by harnessing the forces of nature.

The increased rapidity and breadth of his physical movement, enabling the change of his environment and intermingling, has been a most important stimulus to his development.

Progress and Prosperity.

Intercourse.

Just as the evolutionists believe that the secret of physical evolution is the interaction in the struggle for existence, so the writer believes that all progress has had its foundation in the law of movement. Mental progress has sprung in turn from the physical development of man by means of transportation and intercommunication in many and varied forms, and transportation and intercommunication have been the parents of civilization, which have given it its virility and impetus.

Deprived of comradeship man reverts to the brute existence from which he came. Solitude will eliminate all the fabric of refinement and culture created by generations of civilized heredity.

PREHISTORIC PROCESSION TO A CAVE DWELLING.

We know that solitary confinement frequently results in the dethronement of even the strongest and keenest intellect. The Greek philosophers held that "without society and social duty, there can be no individual moral life."

A Cause Célèbre.

Take a child and isolate it on a desert; without hearing the voice of a fellow human, without seeing any of its own species, it would revert to the animal state, as did Kaspar Hauser, who, though in a civilized community, lacked contact with human creatures.

The fabric of civilization is permanent only in continuity; civilized environment, and contact with advanced people, are of first importance.

Sporadic civilization has shown itself easily wiped out of existence by a barbarian inroad, and civilization was lost, or its effect effaced, when not communicated to other peoples.

Knowledge cannot be hoarded. The trading of ideas has always accompanied the exchange of commodities.

Conservation. Since the conservation of energy is a law of social as well as of physical phenomena, the essential feature of progress is the conversion and improvement of lower modes of energy and progress into those better, more rapid and more economical.

The invention of the wheel and wheeled vehicle was one of the greatest in the world, and the first advance after the domestication of animals to aid in bearing human beings and their burdens.

The Key to Knowledge. Quicker and cheaper transportation, removing natural obstacles and resulting in contact with the greatest variety of external influences, has been the whetstone on which perception has been sharpened and become keen-edged, the vehicle by which knowledge has been

STEPS IN THE DEVELOPMENT OF THE WHEELED VEHICLE.

disseminated, has enabled man to climb to a higher physical, mental and moral plane and has been the mainspring of material civilization.

Culture, learning and kindred influences, are but the result of brains brought together, and the consequent exchange of ideas, which have developed the intellect and broadened the mind.

The mode of life of early man was but animal, if not bestial; there was no wide demarkation between savage man and brute.

The Real Advance. It has been reserved for the last four-score years to bring about, as in the passage of a ray of light, an extraordinary development, evolution and revolution in many directions, greater than that of all the eons of past time.

The development of society was slow, but the places where it did grow and thrive were those where people might meet and mingle by means of communication and transportation.

The Big Carrier. Modern transportation is the winged heel which has permitted us to overcome the sometime lack of intercourse that served as an obstacle to and retarded the progress of earlier periods. It is startling to realize that the road, the highway, and their higher development and offspring, have brought about the world's most potent and practical progress, through their premier position as the greatest land transportation facilities.

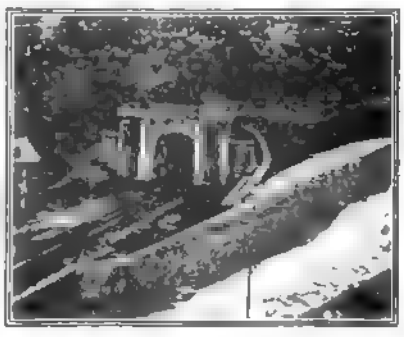
NAPOLEON CROSSING THE ALPS, 1800

Veni, Vidi. Cæsar took four days to hasten from Rome over the Alps, into Southern Gaul; in the last year of the eighteenth century Napoleon consumed as much time to cover the same ground, though in a reverse direction, and though traveling at the highest speed possible under the conditions of his time. No better evidence seems needed than that for the nineteen centuries intervening between these two events, there was practically no advance in the speed of transportation.

As a matter of fact, for five thousand years, or even from the time that man first subjugated the animal, little gain was made in the rapidity of transportation until the last century.

No Progress. The post-riders of Darius, the Mede, covered two hundred and forty miles a day, over better roads and at twice the speed traveled by post-riders of New England in the yesterday of 1846.

ST. GOTHARD PASS



ST GOTHARD TUNNEL

These examples accentuate, more than any figures which may be put before the reader, the importance of modern modes of travel and the wonderful progress which has since been made in the transportation field.

COMMERCE AND WEALTH, AND THEIR SOURCE.

What is Commerce?

Filling Man's Needs.

Commerce is but an exchange of commodities between separated localities. It is the agency which brings producer and consumer together. Lying beneath commerce, the basis of its existence, is want.

The best recipe and way to make man work is to create a want in him, as want is the offspring of desire—an appetite stimulated until it becomes a necessity.

At the end of a journey by camel. The Teutons in Gaul, Medieval times.

The African and the Indian saw the white man's beads and wanted them, because the beads were more attractive in their eyes than anything they possessed. Civilized or semi-civilized people, seeing the more useful, more beautiful, or more palatable possessions of others, desire them for their own.

The Function of Commerce.

The function of commerce is to place material where it is more valuable. Therefore transportation is the basis of commerce, and broadly but another name for it

Certain sections of the country might be stocked with food, and thousands be starving in another, did not inter-communication and means of carriage exist between them. The cause of the terrible famines that were among the great catastrophes and scourges of the world in the past did not always lie in the non-existence of food supplies, but rather in the inability to get the food to the places where necessary

Production and Consumption. Production consists of making matter more desirable by making it available for consumption. But, in order to satisfy wants and make matter valuable, two things must be done; the form and qualities which the user desires must be given to the material, and the article must be taken to him or brought within his reach.

What is Wealth?

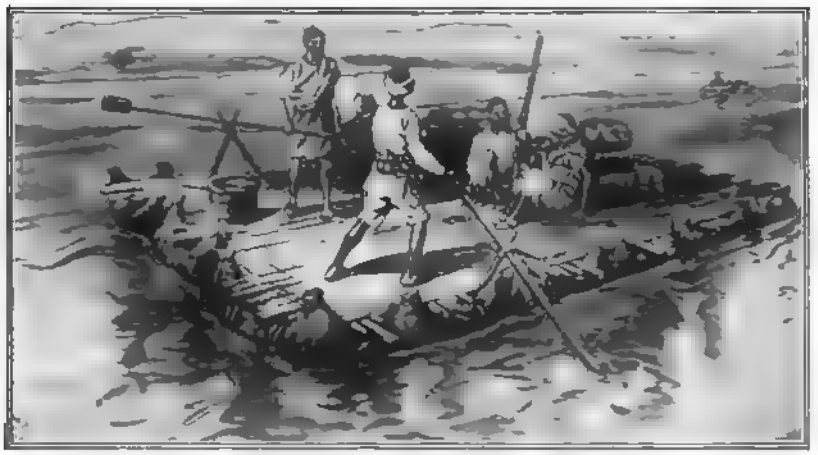
It is the important office of the transportation medium to take the article that has been grown, mined or manufactured, to the place where it will have the most value. Before this function is exercised, only the intrinsic qualities, not the market or exchange value, have been given it.

Wealth. Wealth is the accumulation of those material things that men desire. It is the product of the earth or its resources, and human effort, physical and mental.

Nature is wealth's source, man and his efforts the means by which the source is drawn upon, and capital the stored up resource that lets him do work for the morrow and not merely for to-day. President Hadley, of Yale, describes wealth as not only what we make but what we spend, and what we get for what we spend.

Through the constant extension of the area from which the materials of industry are drawn, and later distributed, come the growth and enlargement of commerce, by which the production of wealth has been greatly enhanced. But this area could not have been increased, had not improvements been made in the means and modes of transportation.

Value and Transport. The major part of the lands or real property of most countries is located away from natural avenues of transportation. Without means of ready access to market, the value of the earth's natural resources, located away from the markets, would be marketably nil;



EARLY RAFT OF INFLATED SKINS ON THE TIGRIS

PREHISTORIC MAN WAS UNPROTECTED BY NATURE AND UNCERTAIN OF SUSTENANCE.

hence, transportation is a dominant factor in, if not a creative factor of, a large part of the world's wealth.

What are Wages?

The real wages of labor are the commodities, the necessities and luxuries, which a day's labor will secure. The Rail Roads, meaning improved and economic land carriage, have been the greatest stimulus in increasing the quantity and variety of the useful things brought within the range of the wage worker's income. They have also greatly lessened the cost of production and distribution to all.

From the foregoing it would seem that inter-communication and transportation have been largely the creators of wants; wants, the creators of commerce; and commerce and trade, in their many subdivisions and varied forms, the creators of wealth, wages, and the means of sustaining life.

Is Modern Transportation a Luxury or a Necessity?

The Importance of Transportation.

Let us see if transportation does not produce even greater results than progress and prosperity. Let us see whether, in giving careful consideration to the value of transportation, we are accentuating something which is unimportant, or one of the most vital factors of human existence.

All living things, save one, are provided by nature with protection. The Creator has given hair to animals, and feathers to birds for protection and warmth; protecting bark to trees and plants; scales to fishes, and cold blood in adaptation to their environment; shellfish are provided even with their homes.

The Necessities of Man.

But man is protected in none of these ways. He must provide himself with covering and shelter, with fuel and with his daily food.

Trees and plants strike root in the soil, and all they need for their existence, they draw from earth and air.

Animals range about, though as a rule, within limited bounds; few roam over wide areas. Usually nothing but untoward conditions—failure of food supplies or the attack of enemies—can drive them from their accustomed haunts.

Primitive man, like the animal, was not a great traveller, keeping to much the same environment, and the boundaries of his movements were proportionately limited.

The World is Ours.

Civilized man long ago outgrew the natural local supply of animal and vegetable food, and had to increase it by cultivation. The being of highest powers and development, he persists, and must perforce persist, in breaking through his environment and in sending or going afield for those things he needs or wishes.

The Divine Command.

Man has obeyed the Divine command to "possess the earth," but, in obeying, he has had to develop avenues of communication.

THE WANDERINGS OF THE FRANKS.

As these increased in number, so did his productive capacity, and when he began producing he frequently found he had a surplus, for which he required a market. At the same time, he desired more and more of the things he found outside his own locality, while others found they needed or wished things that were produced by him. Thus exchange began.

Progress.

Trade throve; intelligence grew; imagination and invention were inspired; ambition and rivalry were stimulated, and effort increased. Briefly, this is progress.

The evolution of trade and commerce that was thus brought about has been hardly less wonderful than the development of life from mollusc to man.

One has only to recall how civilization leaped forward in such periods as those of the later Crusades to realize the influence of intercommunication in making the world of man move forward and onward.

Evolution and Reversion.

Without means of communication, man would be somewhat like the vegetable, rooted fast to the soil. With transportation he passed from the brute stage of savagery, superstition, physical discomfort, excessive bodily labor and uncertainty of sustenance, into their opposite—civilization.

THE ABORIGINAL NORTH AMERICAN HOME AND MEANS OF TRANSPORTATION.

Man's numbers have become so great that he could not revert to barbarism, if he would. Means of transportation to bring food from the great sources of supply, in many cases, he must have. He would have to live, not where he would, but where he could, or perish for lack of the mere necessities of life, as penned-in cattle that have consumed the scant herbage of their little range.

Why? Despite the opening of vast, new fields and the advancement in agricultural methods, the cost of living has steadily increased. Whatever the cause may be, curtailment of the activities, of the medium bringing us our necessities and the cessation of opening new productive areas, would result in this cost being still further increased.

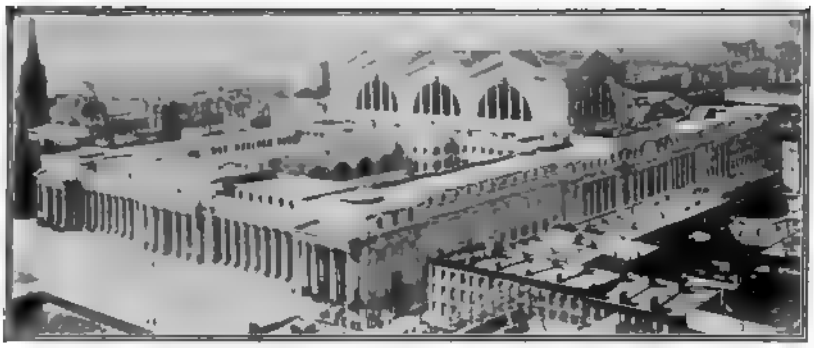
Necessity. Man's survival and the advancement of the world seem to depend upon man's power to maintain and extend his intercourse and means of carriage. The highest development of land transportation that man has known, the "Farthest North" of such intercommunication, is the Railed Road.

Necessities of Commerce. Investment in modern means of transportation is no less important than investment in farms, real estate factories, mines, or the thousands of industries and activities into which man has embarked his energies. The stability and value of the latter properties are largely

PROGRESS AND PROSPERITY CAME WITH IMPROVED MEANS OF MOVEMENT

dependent upon the virility and efficiency of their transportation agencies.

Let us trace the parentage and evolution of carriage, and follow the story of transportation and its results in bringing people and things together, consequences so applicable to our personal advancement, and we will be telling the essence of the story of progress as well as that of prosperity. A well-known economist says that only by careful study of the past, may we find the path of prosperity for the future.



NEW YORK'S NEW $120,000,000 PENNSYLVANIA RY. TERMINAL.

SECTION II.

THE MAGNITUDE OF THE RAIL ROAD.

A Mighty Industry—The Handmaid of Commerce. The Great World Worker.

Industry and Activity.

The material progress of mankind has been due to his activities. These may be divided roughly into four great divisions:

The production of raw materials.

The conversion or manufacture of raw materials into finished or commercial products.

Trading in them.

But principally and most important, transportation to enable the assembling and distributing of both the raw and the manufactured product.

These, therefore, are the links which form the chain that binds the human race together for advancement. They are the foundation stones of practically all industries, on which modern human existence depends.

Within what very narrow limitation, however, would the other activities have to be confined were it not for transportation!

United or Divided.

For these great cardinal activities we might adopt the motto: "United we stand, divided we fall." Transportation seems, however, the connecting link, the life blood and circulation of all.

Transportation exists in two broad forms, by land and by

sea. That transportation by land is by far the most important is evidenced by the fact that the internal commerce of the United States alone is greater to-day than the external commerce of all the rest of the world combined.

In fact, most nations consume the major portion of their products and send only a comparatively small surplus abroad and to others.

Nature's Limited Favors.

Nature favored only a relatively small part of the land with navigable water. Except in a few localities, man cannot change the country's physical characteristics and create water transportation.

Our mines, our forests and our fertile fields cannot come to the rivers. Water will not run uphill. But the Rail Roads have in effect extended the rivers—in the form of carriage—to them. "If the hill will not come to Mahomet, Mahomet will go to the hill."

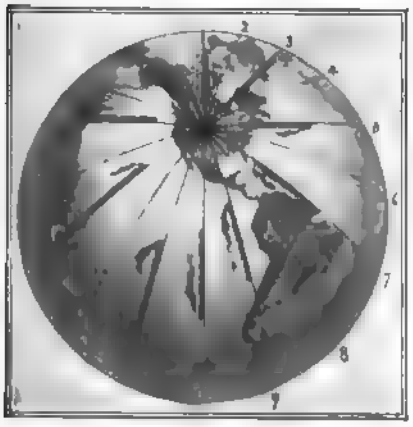
Without the Rail Roads, it would be impossible to give the gigantic ships of modern sea transportation, cargoes that would be more than ballast; they are dependent upon land transportation for lading, as were the tiny ships of olden days upon the caravans. Each Rail Road train is a swift and vast modern caravan.

The World Reversed.

Without the carriage facilities afforded by the Rail Road, the world, as we now know it, would cease to exist. Instead of progress, there would be a retrogression to the isolation and hand-to-mouth existence of former eras.

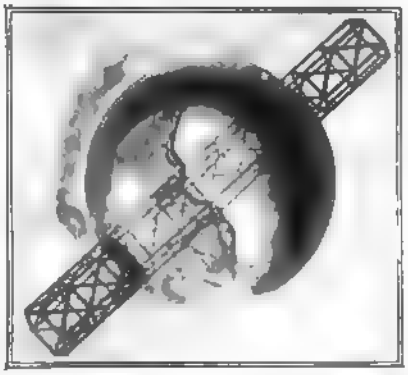
Physical Features of Modern Land Carriage.

Do we realize the magnitude of the Rail Road industry in the United States? Few know the figures. Let us show their significance by comparison with everyday measures, see what is required of them to care for our commerce, and how great or small is the machinery necessary to do this work.



THERE IS MAIN LINE ENOUGH TO GO NINE TIMES AROUND THE WORLD.

THE RAILROADS OF THE UNITED STATES USE BRIDGE STEEL ENOUGH TO FORM AN AXIS FOR THE EARTH



THE UNITED STATES HAS TRACK ENOUGH TO BUILD A RAILROAD FROM THE EARTH TO THE MOON, AND 100,000 MILES BEYOND.

Measuring the Miles.

Wrap a double band of steel nine times around the earth at the equator. This "girdle 'round the earth" will not be as long as the main track of American Rail Roads, 236,868 miles.

Weld on a second band. Carry it four times more around, and this will equal the approximate miles of second, third and fourth tracks, with yard tracks and sidings. In all, there are 342,351 miles of Rail Road track or 684,000 miles of steel rail in the United States.

A 133 Track Rail Road.

So many miles of rails would build one hundred and thirty-three Rail Roads from the Atlantic to the Pacific, on an air-line, or about three hundred and forty from the Great Lakes to the Gulf. Picture a single Rail Road reaching north and south across the country three hundred and forty tracks wide.

But the earth does not seem big enough to give our Rail Roads a chance for proper measurement and comparison Perhaps their length will be better realized when we say that the trackage of the United States would build a Rail Road from the earth to the moon, with an extension to a way station 100,000 miles beyond.

America has more miles of side track alone than the route mileage of Great Britain, Germany and France combined.

52 vs. 78.

In Europe there are fifty-two one-thousandths of a mile of Rail Road for every square mile of land; in America, seventy-eight one-thousandths of a mile. In proportion to area, therefore, we are served fifty per cent. better than Europe.

In Europe the ratio of population to miles of Rail Road, a matter of much importance, is vastly higher. We have an average of three hundred and eighty people to support each mile of road while Europe has more than five times that number, 1,887 for every mile In proportion to population we are served five times as well as Europe.

Rail Facts.

The rails of the three hundred and forty thousand miles of our tracks weigh approximately 43,000,000 tons, and would counter-balance the weight of three-fourths of the people of the earth. There are enough rails to form eighty-two steel rods with which to skewer the earth.

Out of nothing but the new bridge steel used within ten years,

a huge axis weighing about 2,800,000 tons could be forged for the earth.

Spike Comparisons.

"The sky is illumined by unnumbered sparks." We cannot begin to count the stars without astronomical instruments. Even photography shows only one hundred million of them.

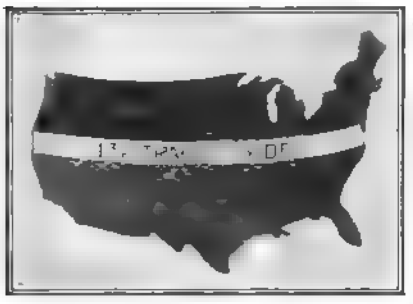
To hold the rails to the ties, in round numbers thirty times as many spikes are necessary as the number of stars which even the keen lens and the sensitive film of the camera have been able to reveal in the sky.

The cost of these spikes alone is approximately thirty million dollars. Only two banks of New York City have a capital of as much as $25,000,000, an amount insufficient to pay this item alone.

The Binding Ties.

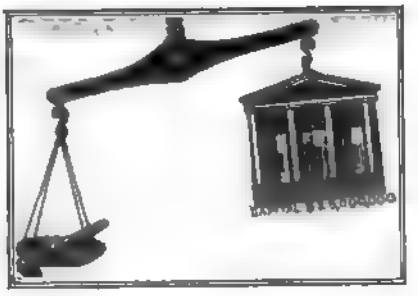
Practically 900,000,000 ties receive these spikes and make the basis for and hold these rails. With their 7,650,000,000 linear feet, a wood-paved way, five ties or forty-two and a half feet wide, might be paved around the earth, which would be wider than the average street from curb to curb, yet there would be enough ties to spare to make three extra transcontinental ways, each forty-two and a half feet wide.

Spliced together, the ties would make not less than a hundred and eighty-three gigantic poles, so tall that they would pierce the earth from end to end and project two hundred miles at each end, tangible north and south poles, indeed, sufficient to furnish endless firewood and souvenirs to that long line of successful Arctic explorers who will follow the trail of Peary.



THE RAILROAD TRACKAGE OF THE UNITED STATES WOULD BUILD 133 TRANSCONTINENTAL ROADS.

THE SPIKES EQUAL IN VALUE THE CAPITAL OF OUR GREATEST BANK.



Rolling Stock.

Houses On Wheels.

A passenger car, even the poorest, to say naught of private, buffet and sleeping cars, is equivalent in cost, no less than in the uses to which it is put, to a house. A suburban home costs from $4,000 to $12,000; the modern passenger car costs from $8,000 to $16,000; Pullmans cost up to $20,000.

On the 240,000 mile Rail Road from the earth to Luna, provided with as many miles of side track as we now have, the Rail Road equipment of the United States would supply nearly ten cars for each mile of track.

Armies In Transit.

The forty-five thousand passenger coaches in use are the moving homes for armies of travellers. In 1909 practically nine hundred million passengers were carried; including non-paying passengers—that is, children under paying age, the crews of trains, the many employees in Rail Way service, postal clerks, express managers, etc.—the total is enough to have given every man, woman and child of our population eleven trips, letting them travel more than thirty-three miles every trip, and paying only a very slight fraction more than one and nine-tenth cents for each mile travelled.

THERE ARE TIES ENOUGH TO MAKE A FOREST OF 163 TREES EXTENDING THROUGH THE EARTH.

THE FREIGHT CARS WOULD MAKE A TRAIN WHICH WOULD ENCIRCLE THE EARTH AT THE LATITUDE OF CHICAGO.

One In Ten.

The train crew averages more than one man for every ten passengers carried. The crew of a modern Pullman express train, with dining car, is twenty or more men, or enough to man a full rigged ship. The freight crews are from five to six men each.

The two armies combined are the equivalent of almost three-fourths of the population of the earth, each riding thirty-three miles in a year upon our Rail Roads.

Moving Warehouses.

Each modern freight car costs about $1,000; and there are two million and one hundred thousand of them.

Run between New York and San Francisco, in forty-car trains, at only a safe distance apart, they would occupy seventeen tracks, and the last seventeen trains would barely be leaving New York when the first were rattling over the San Francisco switches.

Much Left Out. Yet these figures do not include the 100,000 cars used in Rail Road service purely, nor the 30,000 cars owned by private companies. These would fill an additional transcontinental track.

If the Rail Road rolling stock of the United States were running at a speed of twenty miles, divided into trains, at a safe distance apart, it would take one some three years and seven months, at ten hours each day, to review it.

The Puffing Locomotive.

New York to Cleveland. Linked together, our 57,212 locomotives would practically reach from New York to Cleveland, the most gigantic aggregation of artificially developed power in the world. The number of locomotives bought in a single year, 1907—seven thousand three hundred and sixty-two—would make a solid train of locomotives from Jersey City almost to Philadelphia.

AN AVERAGE CARLOAD OF FREIGHT IS HAULED EACH YEAR FOR EVERY MAN, WOMAN AND CHILD IN THE UNITED STATES

Harnessing 33,000,000 Horses. The 57,000 locomotives would be equal in power to about thirty-three million horses, which will be better appreciated when we realize that this is 55 per cent more than all the 21,200,000 horses in the United States.

The average weight of engines increased in four years 15 per cent, and their average pulling power 17 per cent. There was an increase of 36 per cent in average weight in ten years. The motive power of the Pennsylvania Rail Road was increased 126 per cent in six years.

The Need for Cars. The Rail Roads of the United States and Canada placed orders, in 1905 and 1906, for approximately six hundred and fifty-two thousand freight cars—approximately four thousand and five hundred miles of cars—enough to make a solid train across the continent and halfway back. One firm of car builders alone built one hundred and four million dollars' worth of cars in 1907.

EACH FAMILY'S SHARE OF THE FREIGHT HAULED IS FIVE CARS

The People's Work.

Despite this enormous increase in equipment and car mileage, the roads were unable to handle the 1907 business promptly, for in ten years the tonnage had increased 130 per cent.

The cost of this new equipment amounted to $428,000,000, or $1,900 per active mile for additional rolling stock in one year. In the two preceding years $3,000 per active mile had been spent for rolling stock, amounting to $630,000,000. Prices then were considerably lower than now.

Seventeen Tons Per Capita. Passenger traffic is much less important than freight traffic. Seven and a half tons of freight are hauled one mile for every passenger carried the same distance.

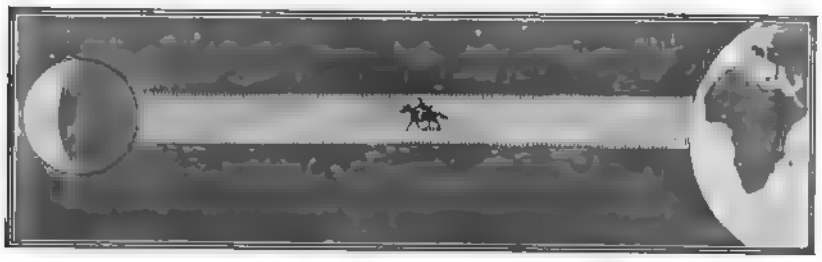
There are delivered annually for each man, woman, and child an average of more than sixteen tons of freight, each ton of which has been carried one hundred and fifty-one miles by rail. Yet per capita the cost amounts, in the gross sum, to only five cents a day, including the vast tonnage used in manufacturing and not subtracting the enormous quantities exported to other countries.

One Cent's Worth of Hauling.

The coal hauled daily by our Railed Roads is one million three hundred and ninety thousand tons, at an average freight charge of about one dollar per ton for three hundred miles. The car itself weighs at least half as much as its load and in an empty condition is usually returned free. Practically, therefore, the transportation companies haul a ton six miles for a revenue of one cent in the coal trade.

A Dollars' Worth of Hauling.

The average freight charge for hauling a ton of every kind of goods from the cheapest and coarsest to silks and velvets for a hundred miles, is only seventy-five and a half cents. Out of this must be paid all charges, wages of every sort, fuel, equipment, interest, upkeep of track, stations, etc., usually loading and unloading, etc., etc.



THE TIES WOULD MAKE A CORDUROY ROAD TO THE MOON.

A Rail Road Passenger Weighs 4 1-2 Tons.

In transportation, the "average passenger" should be considered in tons. Fifty-eight passengers on the average ride in each train, the train weighing approximately two hundred and sixty tons.

The Small Revenue.

Therefore, to transport each passenger, the Rail Road must move four and a half tons of equipment, or dead weight, useful only in making it possible to carry a passenger in safety and comfort.

The "average passenger" pays one and ninety-one hundredths cents a mile; this is for himself and his baggage, plus the four and a half tons of vehicle. At this rate, then, the road would haul him and his four and a half tons of equipment 100 miles at a charge of about 42 cents a ton, which is cheaper than many freight charges. Each passenger carried pays sixty-three cents for his average trip.

Excluding non-paying passengers, each inhabitant of the United States takes approximately ten trips on the Rail Roads yearly, of 33 miles each. The cost of this service is only one and seven-tenths cents per day per capita. But if the individual does not choose to travel, there is, of course, no carrying charge for him to pay.

The Value of the Load.

The value of the yearly production of the mines, farms, forests, factories, etc., of the United States, is estimated at $37,000,000,000. Though all does not get on the Rail Roads, much travels a number of times in a raw state, in the form of partly finished products and in distribution and redistribution, thus making the total value carried probably more than the equivalent of the entire output.

The cost of transporting these products is $1,682,000,000, or practically only about four and a half per cent of their value.

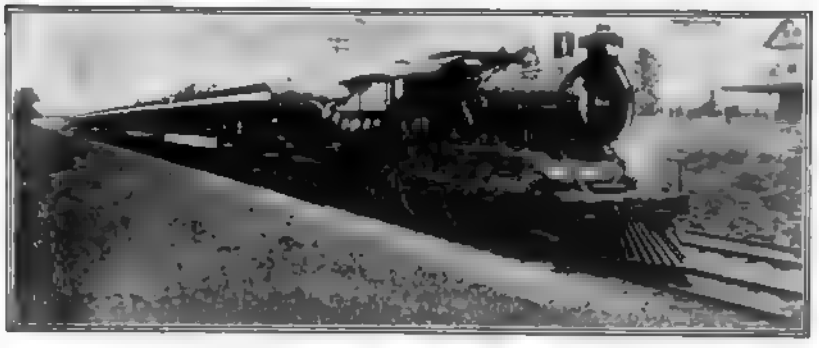
For each family in the United States the Rail Roads ship 75 tons annually; this is equal to one ton being shipped a total distance of 11,325 miles.

The paying members of each family also take forty-six trips per year, for a total distance of 1,504 miles.

In a New Light.

Perhaps the most startling idea of the stupendous service rendered by our Steam Roads is presented when we show how large a quantity of equipment would be necessary to contain at one time the freight and passengers using our Rail Roads each year.

At the present average of 11 passengers to a car, the twenty-nine billion passengers travelling one mile a year would occupy a sufficient number of cars to make 1,400 solid passenger trains around the earth at the equator.



A MODERN PASSENGER FLYER.

Around the Earth.

If the two hundred and eighteen billion tons of freight carried annually were to be loaded into cars at one and the same time, at the present average of 13 tons to the car, they would fill five thousand one hundred trains, each reaching around the earth at the equator.

The Importance of the Rail Road As a Distributor.

Rail Ways and Distribution.

The Rail Roads of no nation are so interesting and important as those of the United States. To them, it would appear, more than to any other agency, is our country indebted for its prosperity, and the progress so quickly effected.

Before the Rail Roads were built our producing zone was practically only a narrow fringe of territory along the Atlantic coast. With ordinary highways only the smallest fraction of our vast agricultural lands would have substantial value. The markets could not be reached with their products, nor luxuries and necessities be economically obtained by them in return.

Highways and Distribution.

Over ordinary highways wheat will bear with profit transportation for no more than two hundred miles, and corn 100 miles. These are the most important and valuable of our cereals.

If the hauling necessary to get them to market were done over common roads, they would have to sell for about one dollar, and for fifty cents per bushel, respectively, to pay merely for transportation, leaving nothing to pay for the cost of raising. The same principle holds true of other products of the farm.

Conservators and Carriers.

The people and the nation would seem to owe this industry consideration for the preservation of our Eastern forests. But for the distribution of coal by the ironed road, the consumption of wood as fuel would probably have stripped away every stick of timber between the summits of the Alleghenies and the Atlantic coast.

While it is true that our common carriers have been large consumers of timber, yet the fact that one ton of coal will produce as much heat as two and a half cords of wood, will enable us to realize that for the thirteen hundred thousand tons of coal carried daily by the Rail Roads, three and a quarter million cords of wood would have to be taken from our forests each day to serve the same needs and furnish an equal amount of heat.

Keeping Us Warm.

There is little or no coal within 200 miles of the Atlantic seaboard, and the few canals and waterways to these regions could not carry two per cent of the fuel we now require.

THE IRONED WAYS ENABLE THE TREELESS WEST TO BE SUPPLIED WITH FUEL.

The treeless West would be practically uninhabitable in winter, but for the supply of fuel brou ht upon the iron ways from distant coal fields.

Costly Iron.

Another thing the nation should largely credit to them has been their inestimable influence in the development of industries.

From Alabama to New England the banks of

AN EARLY CHARCOAL IRON FURNACE.

OLD CAROLINA GRIST MILL.

our mountain streams bear the ruins of small iron furnaces which were located at some little waterfall, which furnished the power for the "tub" or wooden hooped blowing engines.

The ores used were lean and meagre, and often had to be transported for miles to the furnaces, which in turn, depended for their fuel upon charcoal burned from neighboring timber.

Early Cost.

The cost of iron in the early thirties—about the time of the beginning of Rail Roading in the United States—was several times what it is to-day.

At such prices, iron could not readily have supplanted wood in building and other operations, and old time quantities and present demands would have made iron prices, for common use, almost prohibitive. Modern carriage made this substitution possible and iron is to-day the greatest of our manufactured products.

The Rail Road has helped to develop almost every industry in the nation in like fashion

Foreign Commerce.

The effect on foreign commerce is no less remarkable. This is clearly shown by the increase which has taken place in exports—from fifty-eight and a half million dollars in 1830 to a billion seven hundred million—about twenty-four fold

In view, then, of the singular position held and service rendered by our land carriers, it would seem that they have been the advance agents of modern progress and prosperity.

What is a Rail Road?

What is Your Answer?

If you were asked, "What is a Rail Road?" what would you answer? Probably, that "A Rail Road is a Rail Road," for that perhaps is as far as it ever occurred to you to go into the meaning of the term.

After our brief résumé of the magnitude of the Rail Road

industry, would it not be wise, for the purpose of getting ourselves intelligently launched, before entering into a consideration of this great agent of progress and prosperity, to consider carefully the broad meaning of the term Rail Road; what led up to the Rail Road, and what is its purpose and relation to the community of today?

Our Guides. By condensing and combining the definitions in Webster's, Worcester's, the Standard and other dictionaries, the question, What is a Rail Road? is authoritatively answered, as follows:—

"A Rail Road is a graded road, with rails designed for wheels of vehicles."

In other words, a Rail Road is merely a graded road equipped with rails.

It is, therefore, to be considered as a road, in its relation to the community and mankind. In fact, early English Rail Road legislation confirms the definition that the Rail Road is only a form of road.

A STREET SCENE IN ANCIENT ROME.

England's Definition. This idea was clearly expressed in an act of the British Parliament in 1823, authorizing the first Rail Road, the Stockton and Darlington, to "charge a maximum rate for every coach, chariot, chaise, gig, landau, wagon, cart or other carriage which shall be drawn or used on said Rail Way or tram road, for the conveyance of passengers or small packages and parcels." Even after the introduction of steam, the Rail Roads were simply toll roads.

In 1838, the Select Committee of the House of Commons recommended that the rights enjoyed by private persons, of moving their own engines upon any Rail Road, should be extended to the postoffice on special terms.

Congress Confirms. In its legislative acts in early days, our own country confirmed the English definition. An act of Congress relating to the Union Pacific, stated:—

"Said Rail Road shall be, and remain, a public highway for the use of the government of the United States."

In the United States the earliest name for a car for passengers was, as it still is in England, "passenger coach" or "carriage." The freight car in England is a "goods waggon."

The word car is of Latin origin; it first meant a chariot, and later, simply a wheeled vehicle.

The People's Parlance. Our own common practice and usage, the source of the definition of words, confirms the dictionaries, as well as legislation.

Rail Road employes speak of "working upon the road."

On the Road. Even laymen use the expression; salesmen always speak of "going on the road," when starting on a Rail Road journey in search of business; any person who makes frequent trips, seldom uses the word "rail," but speaks, as does the Rail Road man and commercial traveller, of going "up and down the road."

If we have any doubt that a Rail Road is a road, this may be dispelled by the answer to the question: On what are transported yearly the eight hundred and ninety million persons, a total of twenty-nine billion miles, and on what are shipped the one billion, five hundred million tons of freight for a total distance of two hundred and eighteen billion miles?

In Simplest Terms. With this definition in mind, and that the Rail Road's true purpose and relation to the public be not forgotten, we go back to and will use throughout this work the early way of writing Rail Road, in two words, emphasizing that it is, after all, simply a road equipped with rails. We will also frequently use the term Steam Road, the only difference in their functions being that on the ordinary road the flesh and blood horse does man's work and on the other road, the iron or steam horse is engaged in his service for fetching and carrying.

Rail Road In Other Tongues The Swedish Jaern Vaeg simply means an ironed way or road and the Danish Jernbane the same. The Dutch Spoorweg means a track or speed way. In German a Rail Road is called Eisenbahn; Eisen means iron, and Bahn, road, so that it is considered an iron road. In Italian, the words Ferrovia and Strada Ferrata are used; the former means an iron road or passage, and the latter a road with an iron railing. In Spanish the word for Rail Road is Ferrocarril, meaning an iron road or way; the meaning of the Portuguese Caminho de Ferro is: Caminho, way or space to go from one place to another; de Ferro, of iron. The French, Chemin de Fer means iron road, chemin being the equivalent of road, de fer meaning of iron; chemin also means progress. The definition of the Russian equivalent is also iron road or way.

What is a Road?

The University Encyclopedia gives as the meaning of road: "An artificial pathway, formed through a country, for the accommodation of travelers and the carriage of commodities."

The Tram.

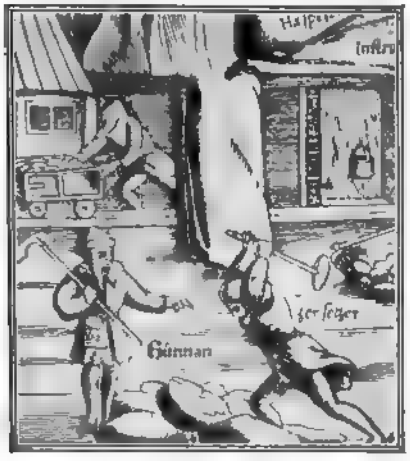
The first Rail Way or Tram Way was a horse way, or road with a rail laid on either side. In England it received its name from General Outram, who adapted the system from one used in the Hartz mountains of Germany. It was first called "Outram's Way," which gradually evolved into "tramway."

We speak of corduroyed roads, of macadamized roads—why should we not speak and think of Railed Roads? It will give us a much clearer idea of what they are and their proper function. The writer will therefore frequently use the term Railed Roads.

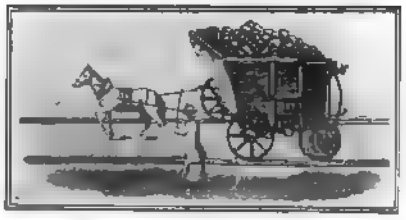
The Theory.

Brandes's Dictionary of Science says:—

"The object to be obtained by the construction of a road of any kind is to effect the transportation of loads at the least possible expenditure of tractive force; and one road is better or worse than another, as the same moving power is capable of drawing a greater or less amount of load, and as the moving power, whatever it may be, is expended in overcoming the resistance of the carriage on which the load is borne."



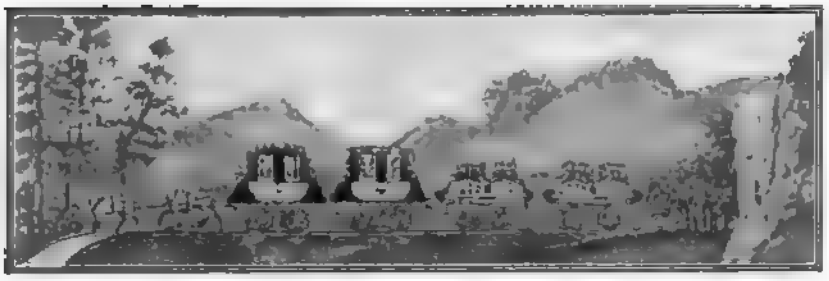
THE FIRST CAR ON RAILS FROM A PRINT OF 1550



ONE OF THE FIRST HORSE RAILWAYS, GERMANY. THE RAILS WERE LAID ONE ON EACH SIDE OF THE ROAD. THE FIRST RAILWAYS, AS WELL AS THE FIRST ENGINES, WERE USED FOR THE COAL MINES

To have the best road, therefore, some expedient must be adopted permanently to diminish the resistance, the cause of which is stones or other hard substances over which the wheels and load must be raised.

If these projections, or unevennesses, are frequent, it is as if the moving power had continually to raise the load an equivalent height.



THE LINZ-BUDWEISER HORSE RAILWAY, GERMANY, 1828.

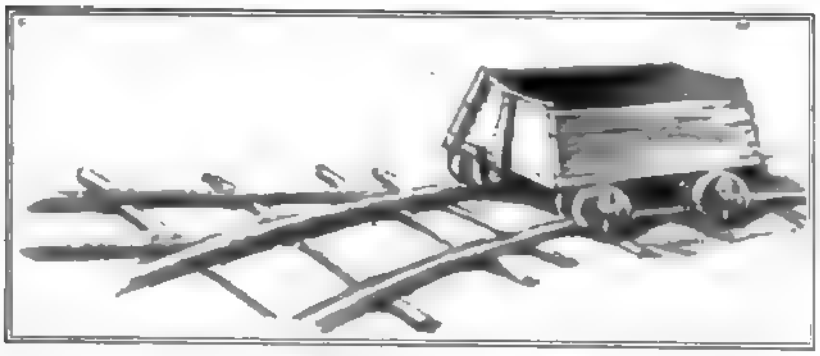
Ruts. If cavities or ruts occur, the wheels sink into them and the moving power is constantly expended in raising the load out of these minute hollows. Any roughness or unevenness, however slight, is a rut.

Though a road be free from ruts and roughness, if its surface is soft, the wheels sink to a certain degree and produce the effect on the motive power of continuously pulling the vehicle out of a rut or up hill.

Overcoming Difficulties. When the surface is not perfectly horizontal, or has any acclivity, it is an inclined plane up which the load has to be drawn. In such a case, the force of gravity is pulling the load back in proportion to the steepness of the incline.

Pulling Back. Thus, if the road rises in the direction of the motion one perpendicular foot in fifty feet of distance then as much extra power will be absorbed as is necessary to pull the load up one foot of height.

Therefore, to get the best results, the resistance to the moving power must be diminished as much as possible, which may be effected by smoothing and evening the road surface, giving hardness and durability of structure, and making light grades. The Rail Road uses the lowest gradients, has a smooth, ironed surface, and therefore would seem to fill the highest requirement and definition of a good road.



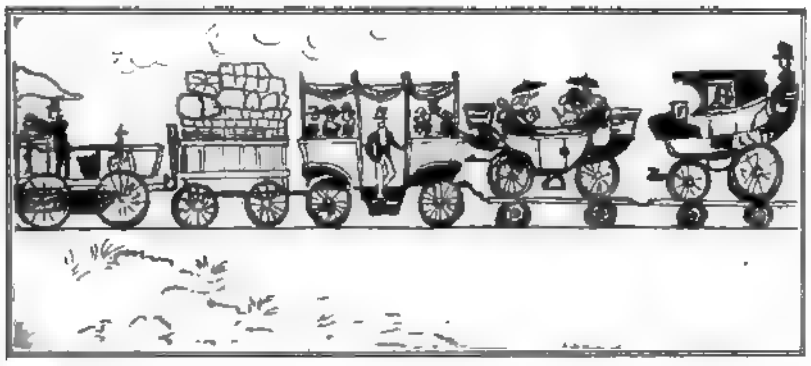
A PRIMITIVE WOODEN RAILWAY AND CAR WITH FLANGED WHEELS.

Brandes, writing in 1853, when Rail Roads were still in their swaddling clothes, said:—

A Good Road.

"Nothing conduces more to the advancement of a people in every way than the construction of good roads.

"If intercommunication did not exist, all the inventions and advantages of which we are possessed to-day could be enjoyed only by a very limited number of people in the very sections in which they are made, while without Roads and Rail Roads, large towns positively could not exist, because of inability to feed their inhabitants."



A SKETCH OF AN EARLY TRAIN, SHOWING PASSENGERS RIDING IN THEIR OWN CARRIAGES ON FLAT CARS.

The First Road Law.

The first road law in the United States is said to have been passed at Chester, Pa., near Philadelphia. It declared that "each man must make and keep a good road as far as his land extended, in order that products might be marketed and intercourse among neighbors and friends be encouraged."

Building Your Own Road.

Would not our people be gravely burdened if today each man had to make and maintain his own road, and in addition to this, his own Railed Road for his long-distance traveling? The thrifty would build good roads while the indolent and shiftless would construct their sections poorly. Further complications might arise in connection with those financially or physically unable to build any road. The result would be that the whole public would suffer, particularly the traveler, the producer and other users of the road.

Not a Foreigner.

As the Rail Road takes the place of, or supplements the roads in the localities it traverses, it appears that it is intimately connected with the welfare of the sections it serves and an essential economic factor of their welfare.

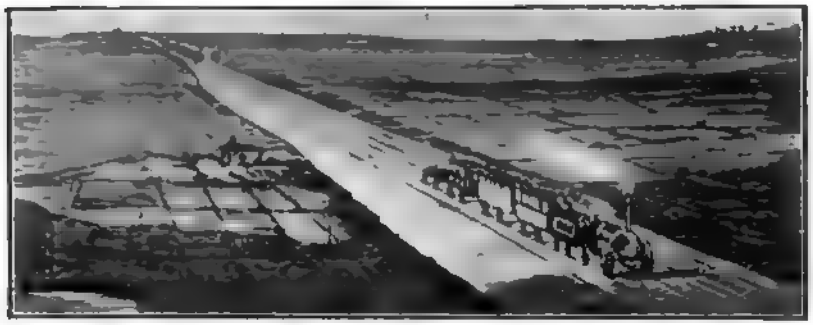
These questions also are worthy of consideration: "Have we built our roads ourselves or has someone built an important part

of them for us? Has the most benefit accrued to us or to the builders?''

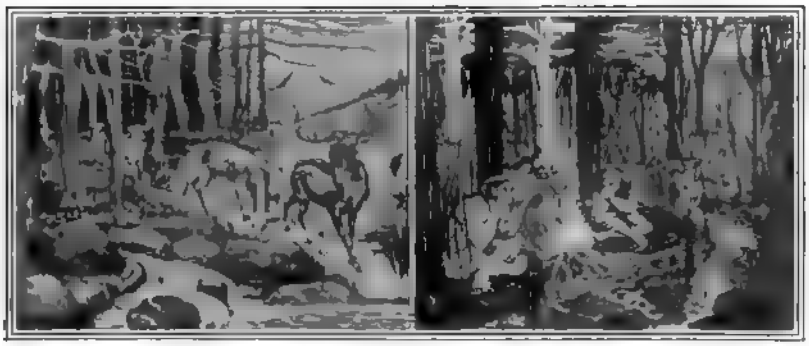
If we need to use these roads, are we not intimately interested in them, in their maintenance, efficiency and welfare, and are they not among the most important of our highways and avenues of communication?

Subtraction. If we are doubtful that the Rail Roads are roads, let us see how many good roads would be left if we were to subtract the Railed Roads from the roads of the nation.

Therefore, might we not say that the constructors of and investors in Rail Roads are merely ''good roads'' builders?



A TRAIN OVER CHAT MOSS, ENGLAND, 1830



THE FIRST ROADS WERE PATHS BEATEN BY ANIMALS BETWEEN THEIR FEEDING AND WATERING PLACES.

MAN FIRST LIVED ALONG THESE PATHS TO SECURE FOOD.

SECTION III.

THE MAKING OF NATIONS.

The Story of the World's Progress and Prosperity.

Roads, the Ancestors of the Rail Roads—The Arteries of Nations. Their Influence Directing the Course of Great Movements.

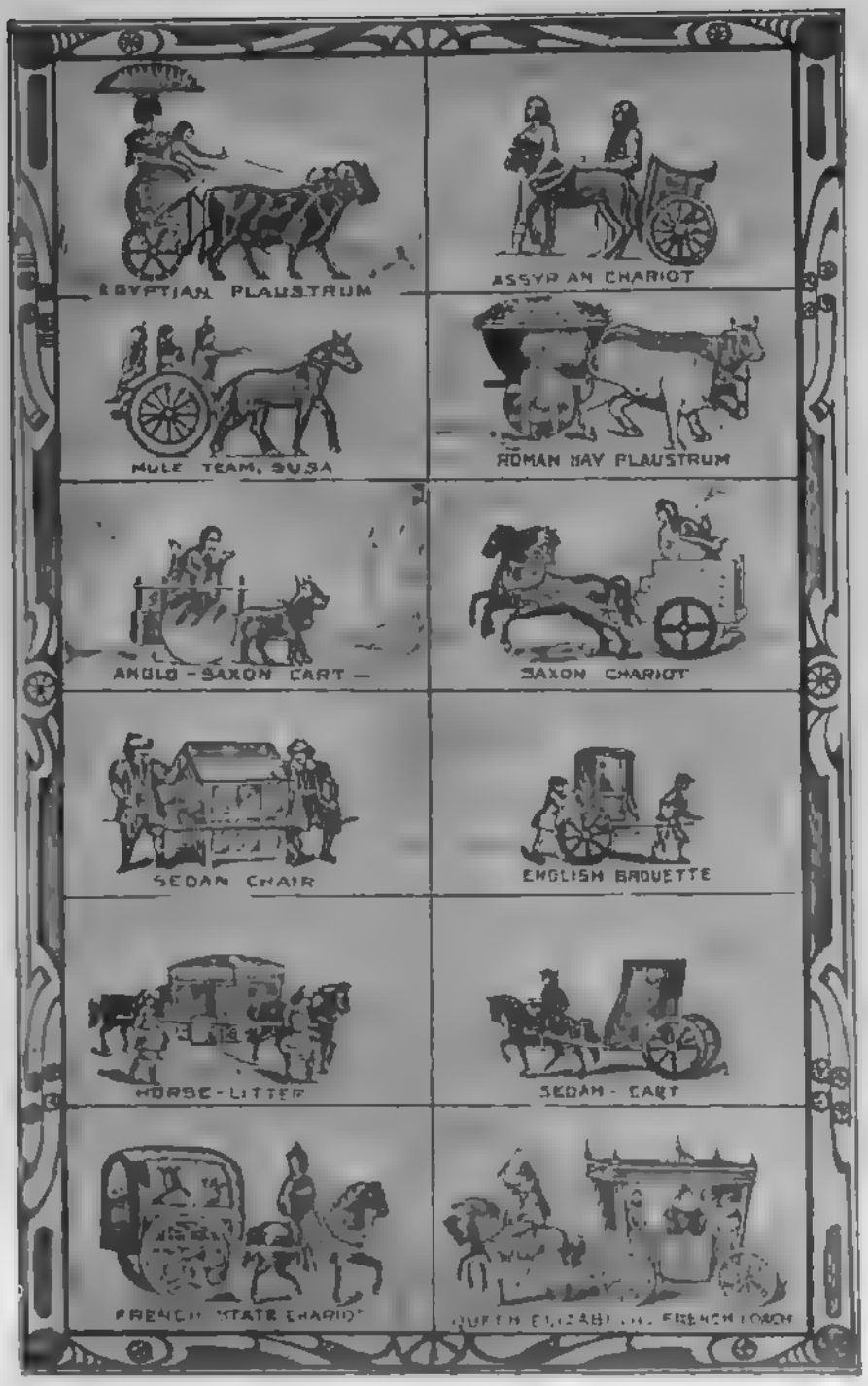
No Intercourse—No Progress.

Prehistoric Roads and Highways of the Ancients.

Man's First Roads.

The first roads were paths beaten by prehistoric animals, between their feeding places and their watering holes.

Man found it easier to follow these paths than to break a way through tangled forests or over rough country. Besides, these trails brought him to the haunts of the game upon which he subsisted. By following these paths, or lying in wait along them, he was enabled to obtain his sustenance with the least exertion. His only purchasing and procuring medium at that time was his strength.



THE DEVELOPMENT OF THE CARRIAGE

Then As Now. Man lived along these trails and camped where he slew an animal until it was eaten, or used the trail or road as the easiest means of carrying it to his cave or habitation. He had no mode of travel except afoot and no transport medium save the primitive one of his own back, a strong incentive to keep close to his food supply. To-day, man still prefers to live along the roads most convenient to supplies.

In interior Africa wild beasts still make such paths, and many of the Dark Continent's present highways are only trails beaten firm by the bare feet of man. When borne over such roads on the backs or heads of human beings, only a few costly things, such as gold, ivory and rubber can stand the transportation charges, even though labor is of very slight value.

Better Roads Begin. With organized society artificial roads began; and it has been by constantly improving roads that nations have progressed and prospered.

Roads of the Eastern Nations.

Early Egyptian Roads. The Egyptians, whose civilization is believed by some to be even more ancient than that of Nineveh and Babylon, maintained a great number of excellent highways for commerce with the south, with Libya on the west and with Palestine and adjoining countries on the east.

Early freighting on the Nile

Much of her commerce was conducted then, as now, on the backs of camels or other beasts of burden, or on her great highway, the Nile, and its canals. Quays and breakwaters along the Persian Gulf encouraged foreign commerce there.

Farther East. The solidity of Egypt's early land roads is evident from "Itaki Atabeck," a highway of which traces still are visible. From Susa to Troy, Memnon travelled this road, to rescue King Priam.

The Phoenicians, occupying a narrow territory between Northern Palestine and the Mediterranean, were the greatest traders

and colonizers of early times. Tyre, their chief city, was the distributing point between east and west. Among their distant colonies were Carthage on the North African coast and Scotia Major, or Ireland.

The Whale's Road.

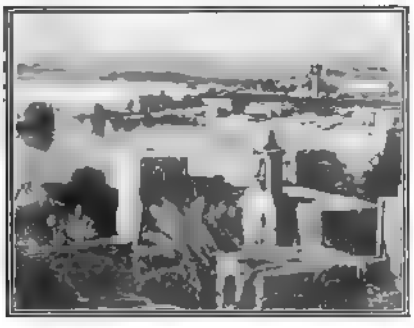
Their principal highway was the sea, called by the early Anglo-Saxons "the whale's road." Their ships transported heavy cargoes of the famous Tyrian purple, of Indian ivory, slaves, gold and pearl. They brought lion and panther skins from the interior of Africa, perfumes from Arabia, linen from Egypt, pottery and fine ware from Greece, copper from Cypress, silver from Spain, tin from Britain, and iron from Elba, these being the principal articles of early commerce.

The iron industry has been conducted in Elba ever since. The writer knows an American, a master-furnaceman, who recently had charge of the operation of an iron furnace on this famous island.

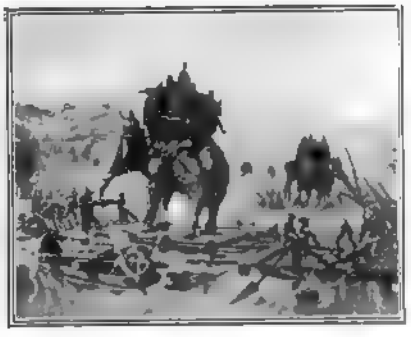
Sidon and Tyre.

The cities Sidon and Tyre were connected by a coast road, which was extended as far as the Isthmus of Suez in order to reach the commerce of the East.

The Phoenicians established great commercial land routes by which their merchants journeyed, penetrating the interior of Europe, Asia and Africa to gather the cargoes for their ships.



TYRE



HANNIBAL'S ARMY CROSSING THE RHONE

Carthaginian Highways.

Phoenician Carthage became, second only to the mother country, the greatest mart of commerce. Recognized as the port of a great North African trade empire, she had a fleet which traversed all known waters, and an admirable system of highways, both at home and in her colonies. Her highways were the model of the Romans, those greatest of road builders.

Under Darius, Persia stretched 3,000 miles from east to west, comprising 2,000,000 square miles. Excepting Rome, it had, in early times, perhaps the best system of roads, but they fell into decay, and with them, the nation.

The Medes. Medean roads were built connecting the Mediterranean cities of Ionia with Lydia, Babylon and royal Susa, and led from Syria into Mesopotamia, from Ecbatana to Persepolis, from Armenia into Southern Persia, and thence to Bactria and India.

These roads were surveyed accurately; many of their milestones still remain along the ruined road from Ecbatana to Babylon. Postal communication, though only on royal business, was maintained over these roads, and couriers, riding with relays of horses, covered 240 miles or more in twenty-four hours.

Chinese Roads. Many years prior to the advent of the Christian era, the Chinese began to construct long, wide, durable roadways paved with hewn blocks of stone, perfectly fitted and well cemented, which furnished an excellent flat surface. Many of these roads are used still. On the top of the great Chinese wall was an important road 1,250 miles in length.

THE GREAT WALL OF CHINA, SHOWING ITS ROAD ON TOP.

The Chinese were also pioneer canal builders and these with their many rivers made a formidable network of waterways.

Highways of the Western Nations.

Ancient Greece. Western civilization was born and cradled in Greece, extended to Rome, thence reaching other European peoples.

For foreign intercourse, the Greeks relied chiefly upon the sea. The Senate at Athens devoted much time and money to the state roads.

Public highways connected all the large towns with the national sanctuaries and oracles of Olympia, the Corinthian Isthmus, Delphi and Dodona.

Athens. Athens was connected with her harbor, the Piraeus, more than four miles distant, by a highway two hundred yards wide, scarcely equalled anywhere to-day.

The Roman empire at its zenith embraced practically all of Western Europe, including England, all of Northern Africa, and

those Asiatic countries now included in the Ottoman and Persian empires.

Its population is estimated to have been about 120,000,000, or a third more than the 1910 enumeration of the United States.

All Roads Lead to Rome.

The provinces of this vast realm were connected by more than 50,000 miles of solidly constructed highways, radiating in all directions from the Imperial City.

One great chain of roads extended 4,080 Roman miles of 1,640 yards, from the wall of Antoninus in England through Rome to Jerusalem, the English channel being practically the only break in the chain.

Roads and Roman Growth

These highways, built to facilitate the movement of armies, made it possible for civilization and progress, through commerce, to creep amongst the barbarians, making conquests infinitely more permanent and valuable than those made by Caesar with his legions.

In this respect, the Roman roads were worthy forerunners of our Steam Roads; they were the real builders of empire, just as our Railed Roads have been the real builders of our republic.

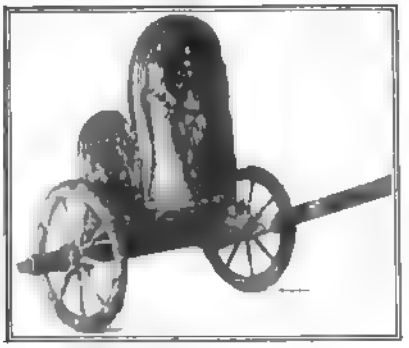
First Straight Road.

The Romans soon improved upon the art of road-building as they learned it from the Carthaginians. They laid out roads with low grades, in straight lines from station to station, building bridges, tunnels and viaducts to overcome natural obstacles.

A firm foundation was provided always. Wherever necessary the ground was rammed with small stones or fragments of brick. A pavement of large stones was laid next, set firmly in cement. We have not improved upon this method. It is the best base for laying Belgian blocks or wood or asphalt pavements.

First Regular Wagon Tracks.

Sometimes these early wagon roads were double tracked, with a raised footpath in the middle. Immense sums were expended by Rome in construction and upkeep of roads, no other public outlay being larger This imposed a tremendous burden on the people, but the results justified the expenditures.



OLD ROMAN BEGA.

THE APPIAN WAY, AS IT STILL EXISTS.

The acme of roads was reached in the Roman road from Spain through Gaul to the Alps, and thence to Rome.

After two thousand years of almost continual usage, many of these roads are in almost perfect condition. It has been proposed by automobilists in England to reopen some of these Roman roads, which now are running through fields.

The Appian Way. The Appian Way, from Rome to Capua, built in the fourth century before Christ, and afterwards extended to Brundisium, is still an object of admiration and interest to the traveler. The "Via Aurelia" and "Via Flaminia" were other famous Roman roads.

An efficient postal service, maintained at the expense of the cities benefited by it, was established under Augustus. Relays of couriers were stationed upon the roads, and vehicles were provided to hurry information forward. This service, originally established for the government, was opened later to the public.

Intercommunication in the Middle Ages.

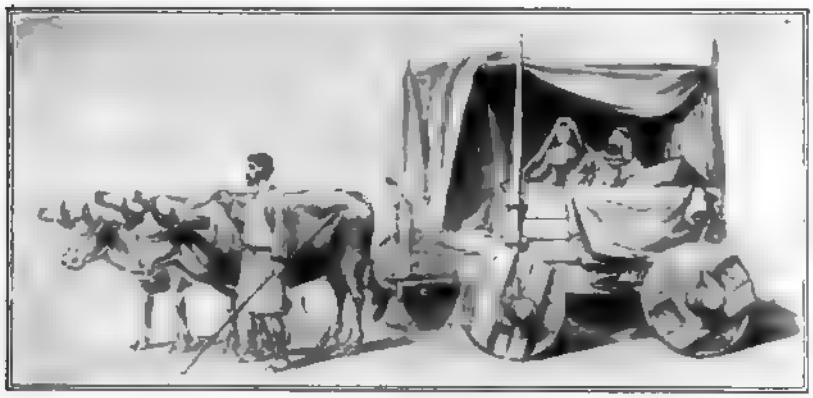
Barbarians Destroy Roads. "The highways of Rome, the glory of its people, were also the heart strings of the empire." With their destruction by the barbarians, disintegration began, Roman power ended and civilization in Europe became all but extinct.

Rome fell in A. D. 476, and the sixth and seventh centuries were the darkest in the history of Europe. "Commerce almost ceased, learning was stamped out or forced to take shelter in the monasteries, and the continent was given over to bloodshed and pillage."

Commercial Amalgamation. The people would have reverted to barbarism had it not been for the "enlightened selfishness" of merchants' unions like the Hanseatic League. These supplied armed escorts to wayfarers, cleared the roads of robbers and checked the depredations of feudal knights and barons. Commerce and social intercourse between nations revived, and much of the progress, the forerunner of prosperity, was resumed.

Medieval Roads. In the Middle Ages, transportation facilities were exceedingly crude. The roads were ill kept, and only small boats corresponding in size to our canoes plied the rivers. The postal service was reduced to occasional messages from municipalities, convents and universities.

In the eighth and ninth centuries, the wealthy classes began to use horses instead of kine as draft animals, and had rude carts or carriages with clumsy wooden wheels. Even in the days of Queen Elizabeth, vehicles were still crude.



THE CRUDE EQUIPAGE OF FRENCH ROYALTY IN THE EIGHTH CENTURY

Elizabethan Progress. Before setting out on the royal progress of 1572, which included the famous visit to Kenilworth, Queen Elizabeth appointed, to rule the kingdom in her absence "in remote parts"—one hundred miles from the capital being considered "remote" then—the Mayor of London, the Archbishop of Canterbury, and others.

In the reign of James I., who followed Elizabeth, Sedan chairs came into use and four-wheeled coaches began taking the place of carts. But the coaches had neither fifth wheel nor springs. Men went along behind them, steering them by means of projecting poles. Turning a corner was no light matter, especially for the lackeys, who had to lift the vehicle around

Era of Semi-Modern Road and Canal Construction.

France Develops Communication. As the first step toward making a nation of his semi-independent provinces, Louis XI. of France established a postal service.

In the seventeenth century, a system of roads and canals was established, and many of these highways were constructed in that and the eighteenth centuries. The works and the methods of supervision were improved under Napoleon His methods serve as a basis for the present system of Rail Road regulation.

First Artificial Water Way in France.

The Languedoc Canal, designed by Riquet and finished in 1681, was the first constructed in France. It connects the Bay of Biscay with the Mediterranean and is 148 miles long. Its summit level is 600 feet above tidewater at either end and it has one hundred locks and fifty aqueducts. The total length of canals now in operation in France is more than 4,000 miles.

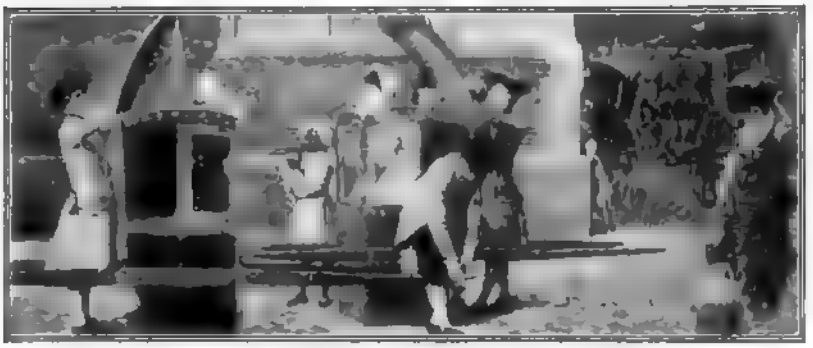
Across Germany a postal route was started in 1516 between Brussels and Vienna. Before the Thirty Years' War the service was greatly improved, but that struggle nearly destroyed it, together with all thoroughfares, trade and manufacturing.

Frederick the Great.

Prosperity began to revive when Frederick the Great, recognizing the lack of transportation facilities as the chief cause of the industrial depression, and probably following a suggestion derived from the English turnpike act, began to construct turnpikes and canals in Prussia.

His example was imitated by the minor German princes.

The Napoleonic Wars halted improvements for a time, but by 1830 there were between 3,000 and 4,000 miles of turnpike in Germany



A SEDAN CHAIR.

In the Netherlands.

In the Netherlands, canals, which to-day largely take the place of roads, were first constructed in the twelfth century.

Amsterdam owes its prosperity to its large canal which leads to the North Sea. It was finished in 1825 at a cost of more than $4,000,000—an enormous sum in those days, though only about one per cent of what our Panama Canal will cost

Coaching in Great Britain.

After the Romans left England, the roads they had built were neglected, and paths became almost the only means of intercommunication.

The first public road was established in 1635, and the first public stage coach route, between Edinburgh and

A POSTILLION CHAISE, FRANCE, 1800.

LEAVING AN ENGLISH TAVERN, 1725

Glasgow, in 1678. The time by coach was three days. It was considered a great achievement when, in 1750, the trip of 44¼ miles was made in half that time.

Eight Days vs. Twelve Hours.

In 1763, eight days were required to travel by mail coach between London and Edinburgh. Only monthly trips were made and the number of passengers averaged twenty-five, with fifty on extraordinary occasions.

To-day this trip is made by rail in less than twelve hours.

The Turnpike.

English Turnpikes.

Although the first turnpike act was passed in 1653, turnpike roads were not extensively adopted in England until the last half of the eighteenth century, when improved methods of construction and the adoption of comfortable vehicles increased their usefulness and popularity.

Turnpikes and coaches finally attained such perfection that the trip from London to Manchester, 178 miles, could be made in nineteen hours; the trip between London and Liverpool, 203 miles, in less than twenty-one hours, and between London and Holyhead, 261 miles, in less than twenty-seven hours.

Early English Freight Rates.

The improvement of roads and vehicles greatly increased travel, but freight transportation continued to be slow and costly. Freight was carried in heavy wagons, the rate reaching 1s 4d, about 33 cents, per ton per mile, or over four thousand per cent more than the present cost in the United States by steam. Because of this practically prohibitive cost, the importance of canals became evident.

Advantages Realized.

In using water-ways men took the burden from their backs and placed it on the water, which bore the load and required them only to apply the power to move it. As the resistance of water is comparatively slight, the load can be much larger than man can carry on his back or load upon a wagon. Two mules or horses can

draw a canal boat carrying from a hundred to two hundred and fifty tons, while they could hardly budge a wagon containing one-tenth of the latter burden, however firm the road.

Canals the Great Medium.

Canal boats might be called prototypes of our great freight and packet vessels. In the eighteenth century, the canal boat—though slow as a tortoise—was the most rapid, economical and dependable vehicle for heavy transportation.

By lessening the cost of transportation, the canals stimulated trade and opened additional markets. In 1772, the English Bridgewater Canal was finished. Others followed speedily and it has been estimated that there were 2,200 miles of navigable canals in Great Britain before the introduction of the Steam Road.

Modern Italian Highways.

As early as the fifteenth century a number of canals were built in Italy. Locks, first used in 1497, were invented, it is said, by that all round genius Leonardo Da Vinci, who was painter, sculptor and engineer.

In Southern Italy, and in Sicily, Sardinia and Corsica, there are no canals and few roads. As a result, commerce and agriculture still languish, and society has been unprogressive.

Scandinavian Transportation.

Long before the introduction of Rail Roads, the Scandinavian countries had good highways and excellent canals.

The Gota Canal, connecting the Baltic Sea with Lake Wener and with the North Sea, through the Gots-Elf, is especially noteworthy. It was commenced early in the eighteenth century, and completed in 1832; it cost $3,750,000.

Russia.

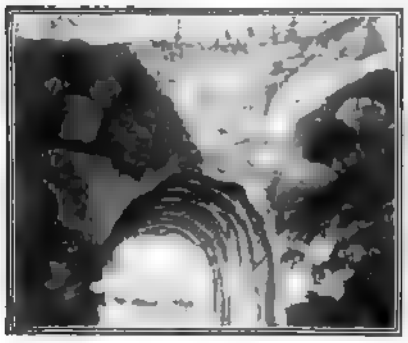
Russia was slow to begin, but once started, she went steadily ahead with road building. The empire has now many miles of wagon roads, and also a considerable mileage of artificial water ways.

SCENE ON THE ANCIENT HONAN CANAL, NEAR CANTON, CHINA.

Backward Nations.

With the exception of Turkey probably no modern European nation has fewer or poorer transportation facilities than Spain.

There are many important conclusions to be drawn from these side-lights on the world's history, which we shall next touch on.



THE GOTA CANAL, SWEDEN.

CANAL DE L'OURCQ, FRANCE.

HISTORY'S INVARIABLE LESSON.

Good Roads Mean Progress, Prosperity, and Great Nations; Poor Roads—Stagnation, Poverty and Insignificant Nations.

Progress and prosperity depend on possession of the means for the interchange of commodities and ideas. Highways for commerce, whether by land or water, are, as history proves, essential and necessarily conducive to civilization.

The building of roads brings development; the decline of roads accomplishes national stagnation if not decadence.

The Beaten Path.

This condensed review of transportation and roads, from the earliest ages up to the nineteenth century, shows that all great nations followed the same course—all rose and fell commercially with the rise and decline of their transportation facilities.

The fate of Persia, for a time the ruling power of the earth, is an instance in line with those cited in the preceding section. Persia, while not entirely eliminated, has lost much of the great territory once hers, and her commerce is nominal, her government tottering and feeble and on a par with her roads to-day. She is practically without a Steam Road.

China.

China had very good early roads and canals but neither maintained nor improved them, and her civilization, progress and prosperity have practically stood still. She should be in the van of civilization and commerce to-day, and would be if she had kept step with the world's commercial methods. As a matter of fact, her wonderful

system of rivers, which were made vastly more useful by many ancient canals that added to her early development, have kept her from decay, although they were alone insufficient to put the country in an advanced position. China, however, is awakening to the realization of the value and benefits of Western methods, and is building Steam Roads.

Venice. Venice was at one time queen of the seas, and dominated the commerce of the globe. When she lost her merchant navy, she dwindled to her present position as a historically interesting point in the itinerary of the tourist.

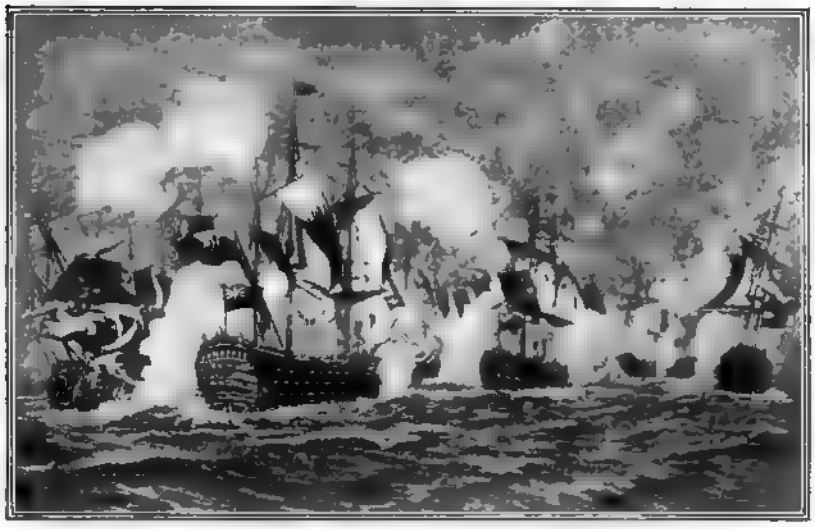
VENICE

Spain. Spain was once the leading commercial power and the colonizer of the world. She made the mistake of depending upon colonies and conquests instead of endeavoring to develop her own natural resources and agricultural possibilities and those of her colonies. She had no internal highways of importance, whether roads or canals, yet, while she had her means of shipping and intercommunication with America she dominated the world.

With the destruction of the Spanish Armada and the loss of her control on the sea, the downfall of Spain began.

Portugal. Portugal, too, had her day of dominance. Her great navigator, Vasco da Gama, found a way to the East around the Cape of Good Hope. For a time Portugal had many colonies and even possessed India. With the loss of her means of transportation, Portugal became little more than a cipher in the commercial affairs of the world.

Holland and the low countries also ruled in the world of commerce while they possessed abundant and advanced carrying facilities. When Holland lost control of the sea to England, much of her commercial pre-eminence went also



ENGLAND'S EXPANSION BEGAN WITH HER CONTROL OF THE SEA.

Great Britain. The tight little British Isles, whose roads and first road-making lessons were obtained from the Romans as early as 49 B. C., are but a speck upon the map of the world. Yet they control more of its surface than any nation and the bands that so successfully hold the empire together are the Steam Road systems of the British Isles and colonies, and England's wonderful ocean Rail Roads, her merchant marine.

These place her in position to carry abroad and serve herself with raw material and her colonies with the finished product cheaper than any nation in the world. Not only British loyalty, but commercial and business ties of mutual interest, bind her and her colonies together.

The Cause of the Rise of Nations.

Nature's Great Help. The early rise of Greece, with the longest proportionate coast line of any country; the mastery and dominion of the whole civilized world by Rome, with the Mediterranean as the center of the empire; the building up of the vast new world-controlling power, Spain, and the later rise to a remarkable strength by the islands of Great Britain, the writer believes, were not due to chance or accident.

The Cause of Progress. The early development of these nations, was the result of their geographical position and God-given natural transportation facilities, which threw them into ready touch with a much greater number and variety of other peoples than nations not so situated.

They were, therefore, able to see, pattern after, and utilize the best and most advanced things and practices in use by other nations, appropriating to themselves the progressive in others to the furtherance of their own development.

Geographical Advantages. Each one of these had the inception of its one-time glorious strength in the easiest of early roads —the sea—followed by the construction of a network of roads at home, thus bringing the nation nearer to itself and to others.

The Saxons of Northern Europe were still practically savages when the nations on the Mediterranean were famed for their learning, civilization and commerce. The Saxons, being inland, did not come into contact with nations further developed than they.

The Nile. The greatness of Egypt was due to her divine blessing and highway, the Nile, practically a water street or avenue along which nearly all her people lived. The Nile afforded means of communication, cheap transportation and food. None of the great monuments, cities or temples was more than a few miles from this great water road.

Navigable. The Nile has no rapids for almost a thousand miles from its mouth and drops only two inches to the mile; its banks are low, treeless and level, forming a natural towpath, and in early days her people towed the dahabeahs, or river craft, as is now done from the banks of canals by animals. Perhaps we may call the Nile a natural canal.

Egypt's early civilization would probably not have existed without the agency of this transportation medium.

The Suez Canal. Perhaps the most ancient canal, and the most noted one to-day, is that between Africa and Asia, now known as the Suez Canal. It is said to have existed originally as long ago as 600 B. C., but was choked up by the sand, and though cleared out on two occasions was each time choked again.

THE SUEZ CANAL AT PORT TEWFIC.

The length of the original canal was 92 miles, no less than 60 of which were dug by human labor with the rude devices then used. The old canal, instead of having one end on the Mediterranean, led to the Nile.

Wise Forefathers.

How moderns sometimes follow the ancients is shown in the fact that the present Suez Canal is laid out largely upon the site of the first one; the modern canal was built by de Lesseps, afterwards of Panama Canal fame, and completed in 1869, at a cost of $100,000,000 for its 90 miles, over a million dollars for each mile. Advantage being taken of several lakes, the work of actual digging was greatly lessened. Nevertheless, this is considered one of the most colossal engineering works in existence.

The Situation in Asia.

China and India owed their interior development to those remarkable gifts of nature, their rivers. They were among the first nations to build and maintain good roads, those of China serving in a degree the same purpose as the Nile.

India and Thibet.

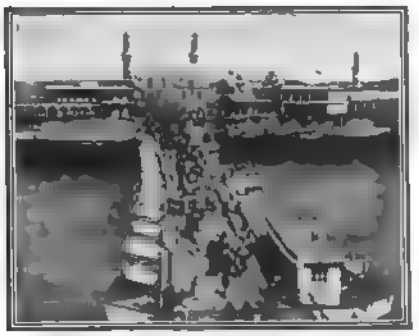
India with its vast coast line is by nature a maritime nation and carries out the writer's contention that insular and peninsular nations have been the earliest to develop.

Thibet, practically a hermit nation, separated from the world by her barriers of ice-topped mountains, was opened to the white man only a few years ago, in the twentieth century. It affords another example of the necessity of communication with foreign people for development of personal comfort and commerce.

Japan.

Japan long remained commercially dormant, while she refused to trade with foreign nations. In fact, so great was the hatred for foreigners and so completely was this a commercial hermitage that men yet live who, when with Commodore Perry's expedition to Japan, saw Japanese merchants beheaded upon the shore for having traded with and sold souvenirs to officers of this expedition.

Japan was the last great country to come into contact with the civilized portion of the globe. But her commercial development



BRIDGE OF BOATS, BAGDAD, ARABIA

CABLE BRIDGE, JAPAN

in fifty years has been greater than that in all the preceding thousands of years of her isolation.

The Medium. Would this have been possible were it not for the great coast line and comparatively small interior, enabling practically all her people to become rapidly leavened by the civilization of the world over her excellent roads?

We shall see later where the United States stood, and where she stands now in transportation facilities, and the reader can frame his own answer as to what would have been the status of the republic had she not adopted the most modern of methods of communication and intercommunication.

The One Great Reason. "In any given age of history" says a well-known authority on transportation, "the nation that has long been dominant has been the one that has furnished or protected the most effective highways for the movement of the commerce of the times.

"The seat of empire moved westward from place to place along the course of the caravans, bearing the commerce of the East, from India, through Babylon, Persia and Egypt, to the shores of the Mediterranean and upon its waters through Greece, thence to Rome and Spain.

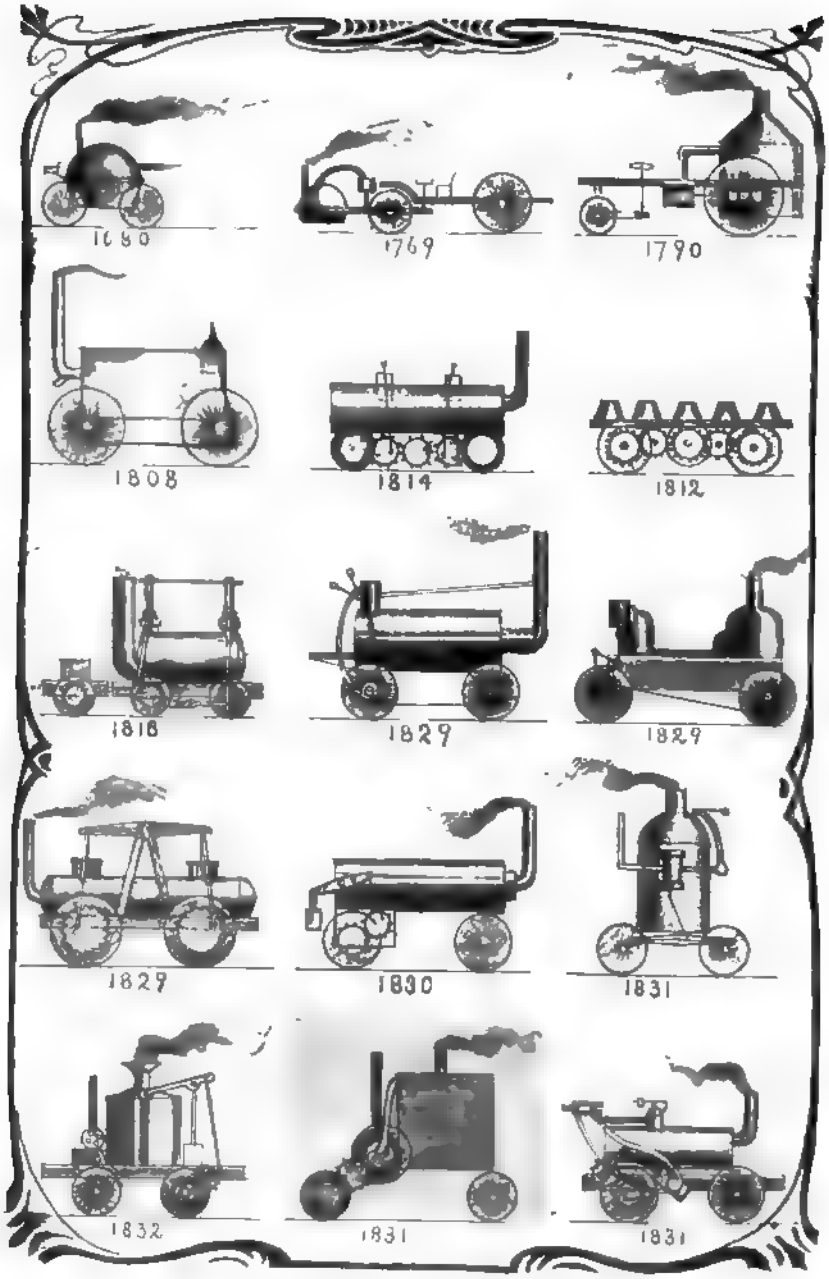
Creation of Wealth. "The carriage of this traffic through Italy, over the mountains and down the Rhine and the Elbe to the German Ocean, gave commercial supremacy to Venice and the Hanseatic towns.

"Its diversion westward to Spain and thence coastwise from Lisbon and Cadiz to Antwerp and Amsterdam, not only made Spain individually great but laid the foundation of the commercial power of the Low Countries.

"When maritime commerce dared the voyage around Africa, the commercial eminence of Great Britain, our mother country, was established Hence she became the great carrier by sea, and as such dominated this newest and cheapest line of transportation.

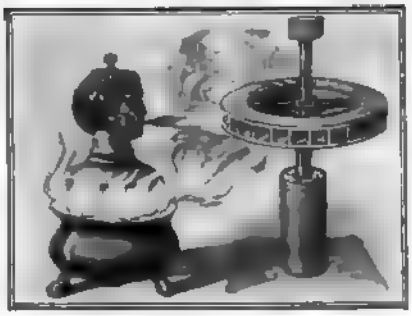
America's Test.

"It is the testing of the real progress of America, with her new born supremacy of the Pacific, to reverse the westward course of empire, and to carry eastward to the markets of the world the commerce that has been the support of the nations since traffic began. But to reach this destiny, the lines of transportation from Asiatic to Atlantic ports, both at home and abroad, must surpass in efficiency and economy of operation the competition of the world."



EVOLUTION FROM THE EARLIEST EXPERIMENT TO THE PRACTICAL LOCOMOTIVE.
NEWTON'S CUGNOT'S READ'S
THE CATCH-ME-WHO-CAN BLUCHER'S HEDLEY'S.
BLENKINSOP'S THE SANS PAREIL THE NOVELTY
THE HOWARD THE GEORGE W JOHNSON THE YORK.
THE ATLANTIC THE CHILD. THE CORTELL.

HERO'S ENGINE, 3RD CENTURY B C



BRANCA'S ENGINE, THE FIRST STEAM TURBINE, 1629.

SECTION IV.

THE GREATEST REVOLUTION OF THE WORLD.

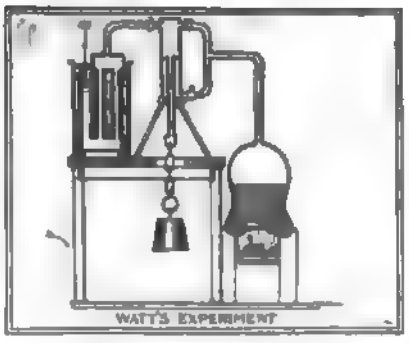
Mechanical Transportation.

The Origin of the Engine and the Tramway.

Hero's Engine.

The idea from which was developed the modern steam engine is found in a crude contrivance fashioned by Hero or Herod of Alexandria, who lived in the third century, B. C. This steam engine was a mere toy, and for nineteen hundred years afterwards little was done to develop the discovery.

WATT AND THE TEA-KETTLE.



WATT'S FIRST ENGINE

In the seventeenth century, however, inventors began to busy themselves with the problem of moving things by power and steam. Sir Isaac Newton is said to have experimented with a steam motor. In 1629 Giovanni Branca wrote a book describing a number of ingenious mechanical contrivances, including what was practically the first turbine engine.

Papin Succeeds.

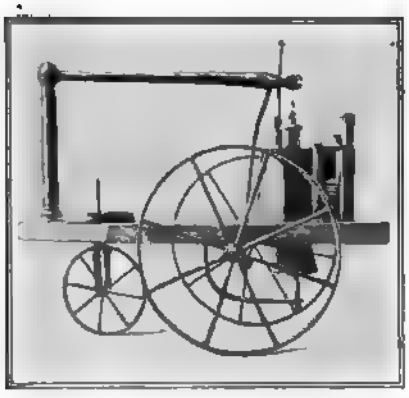
A measure of success seems to have been reached in 1707, when a small steamboat, constructed by Denis Papin, was propelled 15 miles on the Fulda River. Papin was thus a hundred and two years before Fulton. At about this time Thomas Newcomen, an ironmonger and blacksmith of Dartmouth, England, invented what was known as an atmospheric engine, of an entirely new type. It was practically the first which resembled the modern engine in form.

From 1769 on, James Watt, a Glasgow engineer, spent most of his time experimenting with steam power. He developed the system upon which the modern steam engine is constructed.

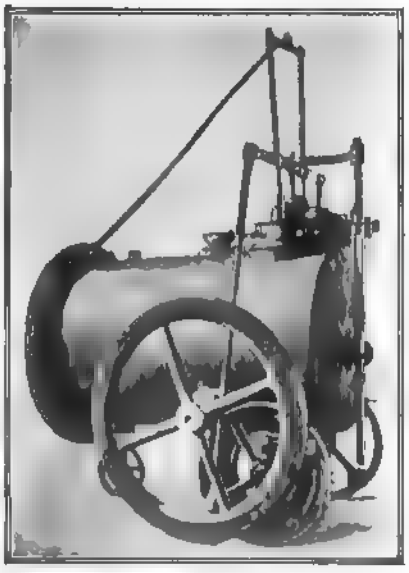
Rumsey and Fulton.

About 1784, James Rumsey, a Virginian, built and operated a boat "by mechanical power" on the Potomac at Shepardstown, in what now is West Virginia. Local tradition says that George Washington rode in it; it is a fact that he mentioned it in a letter of October 10, 1784, to Benjamin Harrison, then Governor of Virginia.

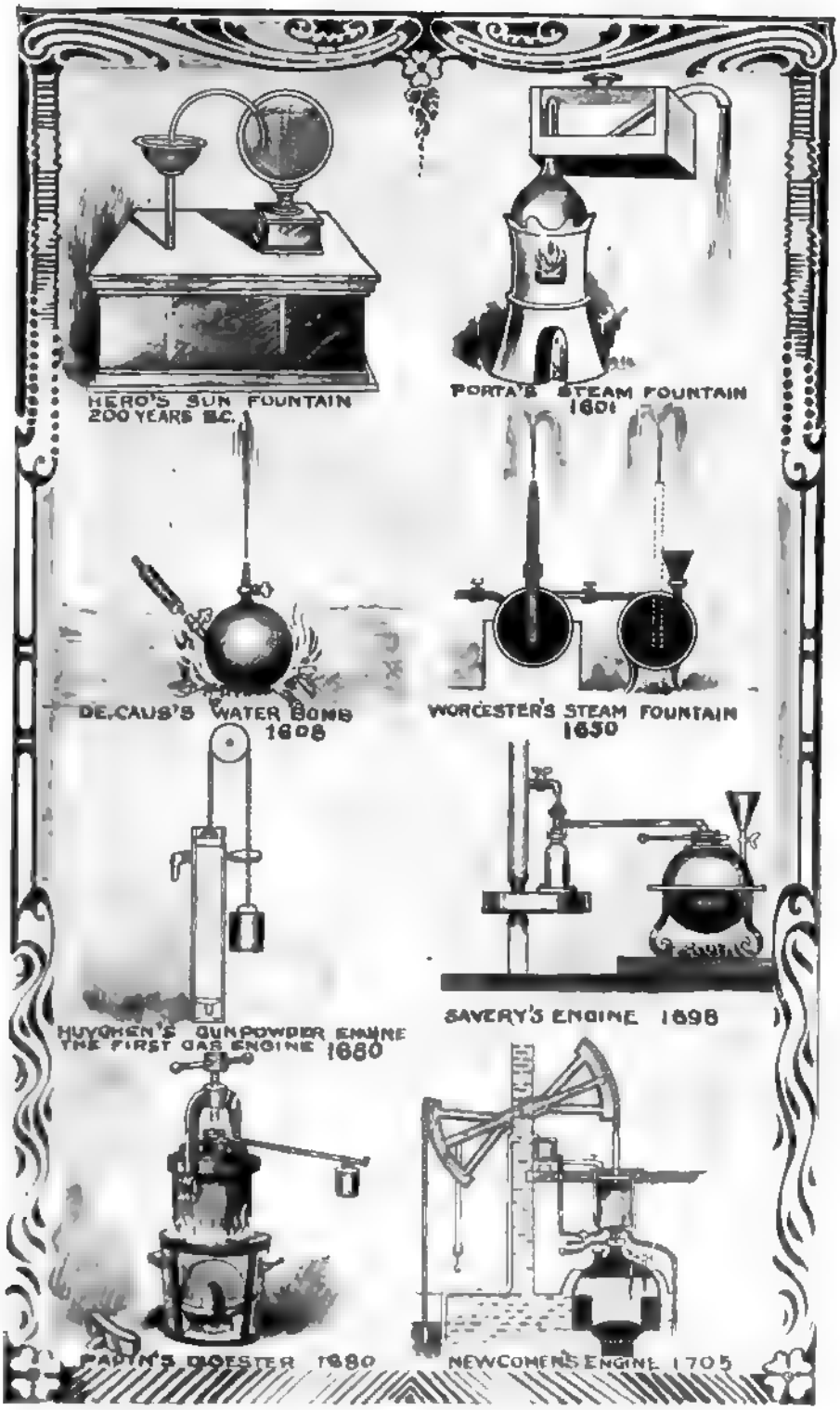
Rumsey went to London to raise money, but fell dead from weakness due to starvation upon the lecture platform while asking financial aid to carry out his plans. There were several other pioneers in steamboat building before Fulton completed the first practical steamboat in 1809.



THE MURDOCK, 1784, WAS A PROTOTYPE BOTH OF THE LOCOMOTIVE AND OF THE AUTOMOBILE.



TREVITHICK'S MODEL, 1800.


HERO'S SUN FOUNTAIN
200 YEARS B.C.
PORTA'S STEAM FOUNTAIN
1601
DE CAUS'S WATER BOMB
1605
WORCESTER'S STEAM FOUNTAIN
1650
HUYGHEN'S GUNPOWDER ENGINE
THE FIRST GAS ENGINE 1680
SAVERY'S ENGINE 1698
PAPIN'S DIGESTER 1680
NEWCOMEN'S ENGINE 1705

The Steam Road.

As early as 1815 stationary engines were employed in England, for the movement of tramway trains through transmitted power, usually by means of cables. The first of this kind, constructed especially to employ stationary power, was the Stockton & Darlington Rail Way, opened in 1825. This was also the first Rail Road carrier of goods and passengers. It succeeded as a freight line, but not as a passenger route, its trains being too slow. The Monklands Rail Way opened in Scotland in 1826 and several other small lines soon adopted stationary steam power.

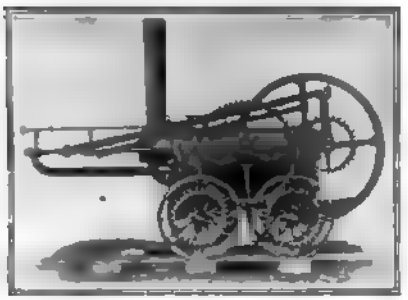
The development of the locomotive became a study as soon as rail locomotion was assured.

The Beginning.

The First Locomotive.

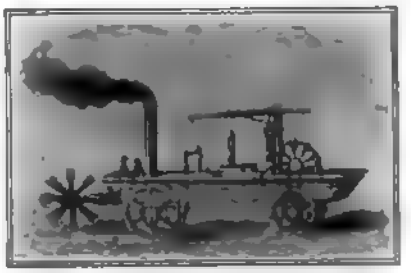
The steam locomotive first appears in the "steam coach" exhibited by Richard Trevithick at Cambourne, England, in 1801.

Trevithick's model was made in 1800. Its first journey was on the kitchen table. Toy as it was, it marks the birth of the successful locomotive. It is to Trevithick that we owe the application of high pressure steam to the locomotive.



TREVITHICK'S, 1803

EVANS' "ORUCKTER AMPHIBOLIS" 1804, FOR BOTH LAND AND WATER



Newton and Others.

Prior to this there were creations of Newton, Cugnot, Murdock, Nathan Reed, who built the first in America, and others, but their machines were road engines of the locomobile or automobile species. Trevithick's model, however, was the germ of his locomotive of 1803, the first locomotive in the world made to run on iron rails.

Success in operating this coach enabled Trevithick soon afterward to secure a patent on a "steam engine for propelling carriages," which is only evidence that a Rail Road is but a further step in the development of, and an improvement upon, the early road.

America's Automobile.

In 1804, Oliver Evans exhibited a steam carriage in Philadelphia. While a trial showed that the carriage would move, capital was unconvinced that the plan was practical.

Blenkensop, an engineer in a colliery near Leeds, patented

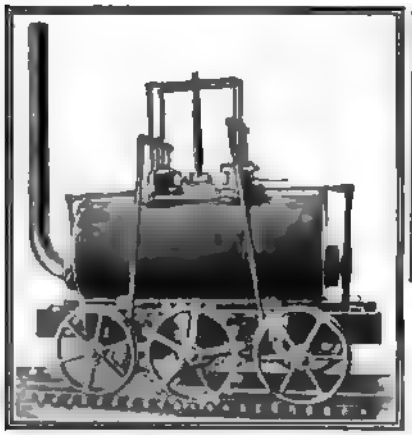
in 1811, a rack-rail, or cog locomotive. The belief at this time was general that the adhesion between the wheels and the rails would not be sufficient, and that on smooth rails the propelling power would be lost through slippage. We should remember that the wheels of the first locomotive were built with wooden spokes and felloes and with iron tires; they were probably not as heavy or substantial as some wooden wagon wheels to-day.

Discovering the Obvious.

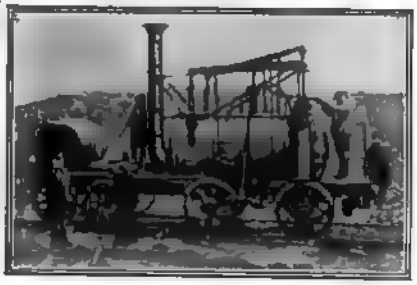
Hence, no substantial progress was made until 1813, when Hedley, who built the "Puffing Billy", discovered that the friction between the wheels and rails is really enough to enable an engine to pull a heavy load.

Engines were built crudely and the boilers were so small that sufficient heat could not be applied to raise and maintain the steam necessary for great or constant effort.

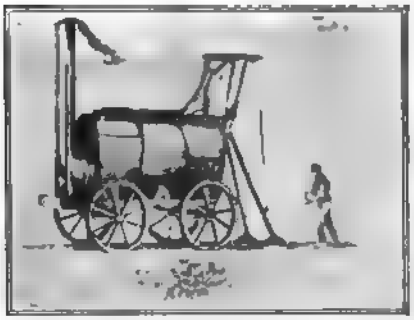
In 1821, a Liverpool and Manchester road was proposed. The directors offered a prize of $2,500 for a locomotive to run ten miles an hour, drawing three times its own weight.



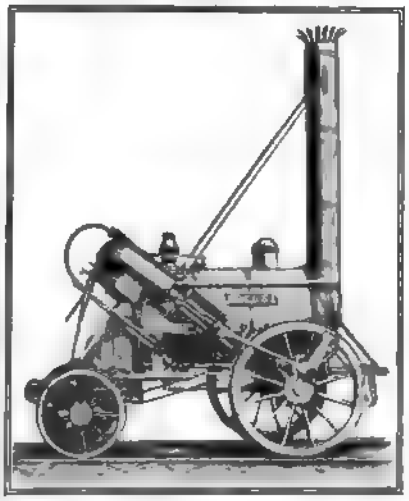
BLENKINSOP'S LOCOMOTIVE WITH COG WHEELS, AND ITS RACK RAIL, 1812



THE 'PUFFING BILLY," 1813.



BRUNTON'S "MECHANICAL TRAVELER," 1813.



STEPHENSON'S "ROCKET," 1829.

LIVERPOOL DEPOT, LIVERPOOL AND MANCHESTER RAILWAY, IN THE THIRTIES.

The "Rocket." Four locomotives competed in the trial in 1829. The "Rocket," constructed by George Stephenson, won. This engine weighed only 8,500 pounds, or four tons and a quarter. Drawing 25,500 pounds, twelve tons and a quarter, it ran 29½ miles an hour.

The other engines in the competition were the "Sans Pareil," constructed by Backworth; the "Perseverance," by Burtsall, and the "Novelty," by the great Swedish American inventor, John Ericsson, of screw propeller and Monitor fame.

Ericsson. Ericsson's hastily constructed engine broke down in the trial. His biographers say it was a much faster locomotive than the "Rocket," and that the engineers of the time admitted the superiority of the principle upon which it was built.

Nevertheless, it was George Stephenson who, after experimenting for fifteen years, had perfected his tubular boiler and thus assured the success of the locomotive engine as a means of hauling trains.

Previous to this all boilers had been like tea kettles in shape and principle, and the fire could only be applied to the exterior of the shell. His invention convinced the world that a revolution in transportation had commenced.

The Greatest Physical Triumph.

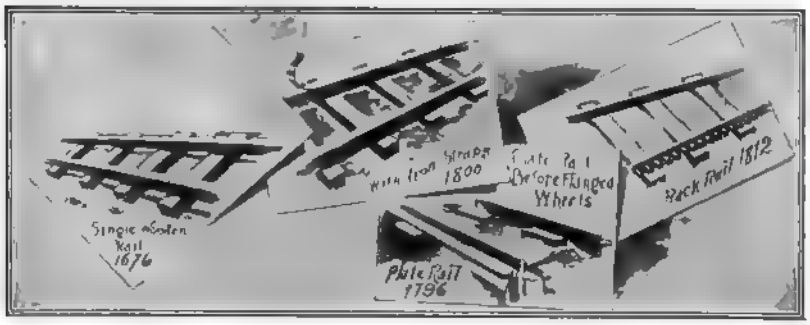
The Elements Subservient. This trial marks the greatest physical triumph of the human race. Henceforth man was to do his work by harnessing and directing the forces of nature. They were to be the obedient servants of his will, the beneficent instruments of his welfare, and no longer, as they had been frequently, merely objects of apprehension and terror.

Early Dividends. The Liverpool and Manchester Rail Way was a success from the start, its stockholders receiving annual dividends of eight per cent, then nine, and finally ten per cent.

As soon as builders were assured of the feasibility of Steam Rail Roads, they began to study the problem of track laying.

The tracks on Roman roads consisted of two lines of cut stones, gauged to the wheel width of their vehicles. In some of the older Italian cities, these stone tracks can still be seen.

First Rail Tracks. The first rail tracks, properly so-called, were used in the Hartz mountain mines toward the end of the sixteenth century, and consisted of flat wooden rails. They facilitated the transportation of ores out of the mines and to shipping points.



EARLY TYPES OF RAILS.

Similar Rail Ways were introduced into England in the reign of Elizabeth, by German miners. In 1630, a Mr. Beaumont sank his fortune endeavoring to introduce wooden rails into English mining operations. Thus have additions for easier carriage made to early roads, finally brought us to Railed Roads.

A Half Way Assistant. At first, however, Rail Roads were simply ordinary ways or roads laid with wooden rails or stringers, in order that muscle-power—human or horse—might move larger loads than upon ordinary roads.

In time the wooden rail was covered with an iron strap. These strap rails were used in the United States as late as 1850. The strap would sometimes curl up and pierce the passing cab or car, making a "snake-head" that endangered the engineer and fireman, as well as passengers.

Iron Rails. In 1738, the first cast iron rails were used, being laid on a colliery tramway at Whitehaven, England. Cast iron edge rails designed for use with flanged wheels, were laid by William Jessop in 1789 at Loughboro, England.

The flanged wheel lessened the danger of derailment. At the same time the roads were improved by using wood, iron and stone

for the substructure. The use of wrought iron rails began later.

Chapters could be written upon the mere evolution of the rail. Scores, if not hundreds, of patterns, illustrate its development.

A Rough Road.

The benefits to commerce and civilization from the use of Rail Roads were so patent that Rail Road building was everywhere stimulated. In Europe, however, the Rail Ways were bitterly opposed by the governing classes.

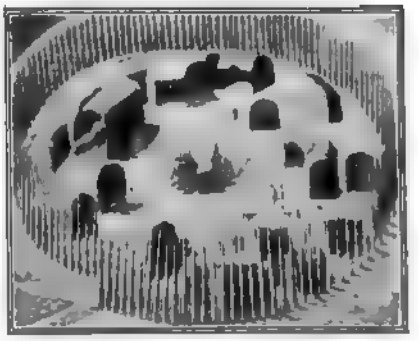
These generally set themselves against anything so revolutionary. This opposition was shown particularly by those interested in the older systems of transportation, such as canals, turnpikes and stage coaches, which, they agreed, were sufficient for every requirement. Even leading English statesmen were slow to realize that with increased transportation facilities, commerce would grow.

Trying to Stem the Tide.

But the new system soon prevailed, for it was as impossible to stem this overwhelming and too long deferred advance as to halt the revolution of the earth around the sun.

AN INDIAN MASSACRE.

THE INDIAN VILLAGE OF POMEIOC, FROM A DRAWING BY JOHN WHITE, HEAD OF THE LOST COLONY OF ROANOKE, 1587



THEN AND NOW—OUR GREATEST REVOLUTION.

Then—the Old Nation. **Now—the New Nation.**

Early Travel in the United States. Some Fascinating Facts.

A Changed Situation.

Imagination must be stimulated and excited to its utmost for us to realize that our great nation, its beautiful landscape, carpeted by fruitful fields, dotted with attractive homes, interspersed with thriving towns and great, busy, bustling cities, which throb with the joys and activities of a progressive, prosperous and contented people, was "a wilderness, not so very long ago, inhabited only by wild beasts, and by a race of red people whose only apparent aim and object was to exist."

Let us see what has wrought the change and the difference in conditions in this same land.

America's First Wheeled Vehicles.

There was a hiatus of but twenty-nine years between the discovery of America by Columbus and the turning of the first wheel on the Western Hemisphere.

In 1521 an enterprising Spaniard brought some ox-carts from Spain, and began hauling freight and passengers from Vera Cruz to Pueblo, Mexico. This was almost one hundred years before the landing of the Pilgrim Fathers, and eighty-six years before the landing of the first Englishmen at Jamestown.

A Sainted Wagoner.

Appreciation of this initial and important factor for progress and prosperity followed swiftly, for the pioneer of advanced transportation in America was canonized by the Pope, and became the patron saint of Pueblo. We are prone to treat our pioneers in transportation in a less reverent and kindly manner to-day.

The Mound Builders.

The mound builders, the earliest inhabitants of America, are said to have made roads or paths, following and developing animal trails. Traces of these roads have been found by archaeologists.

The Indians, it is said, followed their example. Perhaps the most famous of these trails is that which followed the path beaten by the buffalo from the Great Slave Lake in Canada to and across the border of Mexico.

TYPE OF CART, NEW MEXICO, 1521

THE OLD CHURCH AT JAMESTOWN

"There Was Neither."

When the white man came, however, the only means of intercourse between the different tribes of red men was over rugged paths and blind trails through primeval forests, or by floating in rudely made dugouts or paddling canoes upon the waters of the streams.

Early Travel in New England and Its Joys.

It is almost startling, and certainly most interesting and instructive, to compare our early conditions with those of to-day. It is a necessary and fascinating part of our story of progress and prosperity.

"In New England about 1650, a fortnight was frequently consumed in journeying a hundred miles through swamps and thickets."

The Old Connecticut Path. The old Connecticut Path, which the Indians made known to the colonists, and on which they carried corn from the Connecticut Valley to Boston, was probably the first semblance of a road in New England.

SETTLERS APPEALING TO WASHINGTON FOR PROTECTION AFTER BRADDOCK'S DEFEAT

A SETTLER'S CABIN AND WAGON.

Originally perhaps a deer trail, followed by the Indian even as primitive man followed the trail of the prehistoric animals, it zigzagged through the wilderness to the eastern bank of the Connecticut opposite Hartford. Along this route now cluster many thriving towns and cities.

Second Connecticut Path. The second Connecticut trail, which Winthrop notes in his journey of 1648, avoided much of the hilly way.

It started from Watertown by the Charles River, passing thence through Lancaster, Princeton, West Brookfield, and Warren to Springfield. To-day this trail is partly traversed by three Railed Roads.

The Bay Path. The old historic Bay Path became famous in the Indian wars, and was followed by Winthrop the younger in his winter's journey of 1645 from Boston to Springfield, Hartford and New London.

When the first immigrants to Connecticut settled near the Dutch fort, they began to build on both sides of the old Bay Path, thus demonstrating how towns and cities spring up along even the crudest lines of transportation.

Founding of Hartford. They at first called the settlement New Town, but later took the name of Hartford, which it bears to-day. Still later, on the same path, Springfield was settled. This route is now followed by a well-known Steam Road and there are dozens of prosperous cities and manufacturing villages along its course.

In 1715, the Great Court of Massachusetts appointed a committee to discover and report where a road for carts and wagons might be made from Marlboro to Springfield. Seven years later, fifteen pounds sterling, or seventy-five dollars, was expended in carrying the highway from Worcester to Brookfield.

There were no bridges on our early roads, and rivers had to be forded or ferried.

Postal Rates. As an example of carrying charges in the early days of New England, it may be recited that the letter postal rate for a quarter of an ounce, from Rhode Island to Boston was six pence or 12 cents; from Connecticut to Boston, nine pence or 18 cents; the rate from New York to Boston, 12 pence or 24 cents; from Pennsylvania 15 pence or 30 cents; and from Baltimore, 2 shillings, or about a half dollar.

In 1704 there was mail only once every ten days, from Piscataqua to Boston.

Later Postal Rates. In 1798, postal rates for each quarter of an ounce were: 30 miles, six cents; 100 miles, 10 cents; 150 miles, 20 cents; 450 miles, 25 cents; double letters, double rates, and triple letters, triple rates; packet weighing one ounce at the rate of four single letters or 24 cents for each ounce for the minimum distance, and proportionately increased rates for larger distances. Every enclosure was charged for the same as if another letter.

New York to Boston. The first post road between New York and Boston, known now as the Boston Post Road, but then called the Lower Road, or King's highway, was opened in 1772. At that period it took thirteen and a half days to make the journey from Boston to New York. Later the time was reduced to four days and three hours, which was like express compared with the time of 1772. Madame Knight is said to have ridden on horseback from Boston to New York in 1704. She spent five months altogether, including the time she needed for nursing her bruised bones, and the account she wrote of her journey was sufficient to prevent any other woman from trying

CARRYING DOUBLE.

ONE WAY TO FORD A STREAM

EARLY SETTLERS HOME FROM HUNTING

it. In fact, few men ventured to make the same trip for some years afterward.

Freighting on Horseback.

Further Back. There was a period, anterior to the time of stage coaches, when almost all the cross country transportation in Connecticut was done on horseback. In 1793, it is said to have cost $3 per hundred pounds or $60 a ton, for carrying merchandise from Providence to Boston, about forty miles.

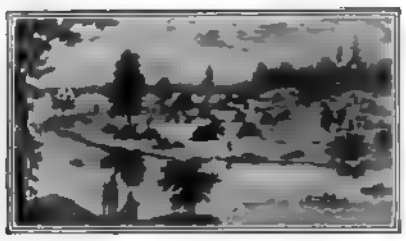
Travelers' baggage to Boston cost three cents per pound for each mile, for anything weighing more than fourteen pounds.

J. P. Morgan's Grandfather. In 1830 there was a stage line from Greenfield, Mass., via Northampton, Westfield and Farmington, to New Haven. About this time, Captain Joseph Morgan, of Hartford, grandfather of J. Pierpont Morgan, with his son-in-law, Major James Goodwin, started a line from Hartford, via Litchfield, to Albany.

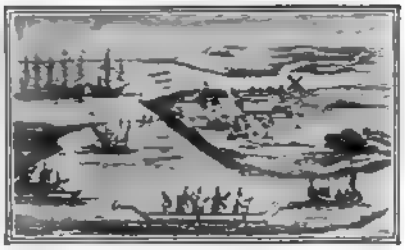
Early Freighting. The heavy merchandise wagons rarely travelled more than three or four miles an hour in those days, and the freight charges were about five dollars per ton, for 10 miles, almost 7000 per cent above the average Steam Road freight charge to-day.

There was another feature of life then that we know little of to-day; the charges for errands ranged from 12½ to 25 cents, according to their value. The teamsters were messengers, and performed commissions for the patrons living along the route.

Early Skyscrapers. An interesting side light of the times may here be introduced. A several times removed great grandfather of the writer's, built what was said to have been the first three-story house in New England; it was probably the first house of such height anywhere in the Colonies. So revolutionary did the structure seem then that it was called "Browne's Folly" and it was even predicted that any such



THE INDIAN VILLAGE OF MANHATTAN, WHERE NEW YORK NOW STANDS.



NEW AMSTERDAM, 1630.

sky scraping building must either fall down by its own weight or be blown over.

The days of early stage coaching are called, in popular parlance "the good old days." But it is a question whether we would like to go back to them. "Travelers were due at the night stopping places somewhere between ten and midnight of the same day they started. The stage started again at three A. M., but lest any of the passengers should oversleep, the calling began at two. Dressing was accomplished by a horn lantern or candle, and then the journey was resumed over the worst roads in the world." We would, from our modern standpoint, call such methods of travel, if enforced upon us, "barbarous and a penance rather than a pleasure."

"The Good Old Days."

The reader who has travelled in cold weather over a bad road, even in a modern coach or stage, can pronounce upon this subject still more forcibly than those who must draw upon their imagination to realize the discomforts and inconveniences, and can testify how much romance there really is in even the imitation of "the good old days."

Early Movement In the Middle States.

Now let us see what were the early conditions of that great factor, communication, on which progress and prosperity so greatly depend, in the middle states.

The First Highway.

The first important "high" way in the middle states is said to have been a bridle path from the settlements below Philadelphia to New York.

When in 1723, Benjamin Franklin, a 17-year-old runaway from Boston, reached New York by packet sloop, he was advised to go to Philadelphia to seek a position.

Losing his way in a storm on New York Bay, he landed at Perth Amboy and went across New Jersey, a journey of three days. In his autobiography, he thus describes the conditions:—

Franklin's Experience.

"There were in that day but two roads across New Jersey, between Philadelphia and New York. One, known as the Old Road, ran out from Elizabethtown to what is now known as New Brunswick, thence to the Delaware above Trenton, where once a week the traveller could get a carriage to Philadelphia."

Franklin's boyhood had long ripened into manhood before the

PURCHASE OF MANHATTAN, 1626. BEFORE IMPROVED TRANSPORTATION LAND WAS ALMOST VALUELESS.

NEW YORK HARBOR, 1667

old road became anything more than a bridle path, or before a wagon rolled over it. This is indicated by an Act of the Assembly, fixing the ferry rate at New Brunswick. Two tolls only were levied. One, for a horse and a man, and one for a single person.

Reckless Expenditure.

Ten pounds sterling, or fifty dollars, raised each year by tax on the inn-keepers of Woodbridge and Elizabethtown, were thought sufficient to keep this pathway in repair.

The other road across the province of New Jersey ran from Perthtown, now Perth Amboy, to Burlington on the Delaware, and in 1707, was wide enough for a wagon to pass without scraping its hubs on the trees.

Early Jealousies.

Even this crude road brought its jealousies, and complaints were made to the Assembly that a patent had been given to several persons to carry goods by wagon over the Amboy Road to the exclusion of the Old Road, "but the governor reminded the people that by this means a trade had grown up between Philadelphia, Burlington, Perth and New York, such as had never before existed."

This leaf from the early pages of our country's history shows how even the crudest road will deflect trade and progress, and revolutionize the social and commercial conditions of a community.

Early New Jersey.

When Franklin used this road, it ran for miles through uninhabited country. The almanacs, the road books of that period, gave only four places "for rest and refreshment on the way."

Two years afterwards, in 1724, when Franklin returned to Boston, he went in a little vessel which took two weeks to make the trip.

Poor Stages.

A little later, stage routes were started between important points in this region. The facilities of the stage lines were limited, however, in various ways. Speed was dependent on the condition of the roads, the infirmities of the motive power and equipment, and the season of the year.

The rates for entire distances, "through rates," even then were

proportionately less than between intermediate points, the long and short haul principle being thus recognized.

New York to Philadelphia in Three Days.

Via Road. In 1736, the first line between the two cities was opened. It crossed the Delaware at Trenton by ferryboat. Three days were necessary for the trip.

In 1797 the Federal line ran from New York to Philadelphia, leaving on week days at 8 A. M., the schedule reading "Dine at Brunswick (30 miles); sup at Trenton (60 miles); arrive early next morning. Fare $5.00; way passenger 4 pence, (eight cents), per mile."

The stage coach occupies a prominent place in colonial, and even later history. Up to 1830, it was the direct means of travel between New York and Philadelphia.

Slow Means of Transit. In 1753, Benjamin Franklin was appointed Deputy Postmaster General of the American Colonies. It is said that in five months he visited every post office in the colonies, except Charleston, S. C. On the old road or King's Highway, he rode in a chaise, with a registering wheel attached, for the purpose of setting mile posts.

Franklin's task was not of great magnitude, for even twenty years afterward, or in 1773, there were only twenty-eight post offices in the United States. Of these twelve were in Massachusetts, leaving an average of little over one to each of the twelve other colonies, which were to assume the dignity of states three years afterwards.

The radius of the Philadelphia post office in 1753 was 60 miles.

Philadelphia to Pittsburgh. In 1786, regular mail was established between Philadelphia and Pittsburgh, once in two weeks, time en route, seven days. "Every 150 pounds of baggage, same charge as for an extra passenger; none accepted unless in dimensions suitable for placing in wagon; 14 pounds of baggage free."

By Boat. About 1800, a transportation line operated boats from New York to South Amboy, stage across New Jersey to the Delaware river, and boat connection thence to Philadelphia. The trip, "wind and weather permitting," was made frequently in "less than a day and a half."

Freight tolls were $1.00 per hundredweight, or $20.00 per ton, more than certain classes of freight could be carried across the continent for to-day. Even at these high rates, freight was "not warranted against robbery or damage." Yet this was only a hundred and ten years ago.

The First Limited. In the same year was established the first "Limited." The Federal Line put on as against their own 8 A. M. service at $5, a run of stages leaving New York at 1 P. M. and due at Philadelphia at 6 o'clock next morning, charging an extra fare of $3.

PIONEERING TO PITTSBURG, PA., THE "FAR WEST," 1810. FROM AN OLD ENGRAVING.

The Slowness of Travel.

Judge Edmond Curtiss, of Connecticut, in going to Congress, found it took two weeks to go from Watertown, Conn., to Philadelphia, and another week to reach Washington.

New York to Albany Awhile Ago.

Before the days of stages, when a man left New York to go to Albany by sloop, the congregation of his church would send up prayers for his safety on such a long and hazardous journey.

Stage Service.

In 1797 daily stage service was started between New York and Albany. The announcement of the company read: "No more than eight passengers. Whole way $10—six pence per mile for way passengers; 150 pounds baggage, same as for another passenger; 14 pounds free. Time, three days"

In 1910 it was taken almost as a matter of course that Glenn Curtiss should make the trip from Albany to New York in two hours and 33 minutes, using an aeroplane as his vehicle.

In 1805, the stage fare from New York to Albany, along the east side of the Hudson river, was $8; way passengers, eight cents a mile. On the west side the rate was the same for through passengers, but six cents per mile locally.

Early Rapid Transit Around New York.

"Chalking the Hat."

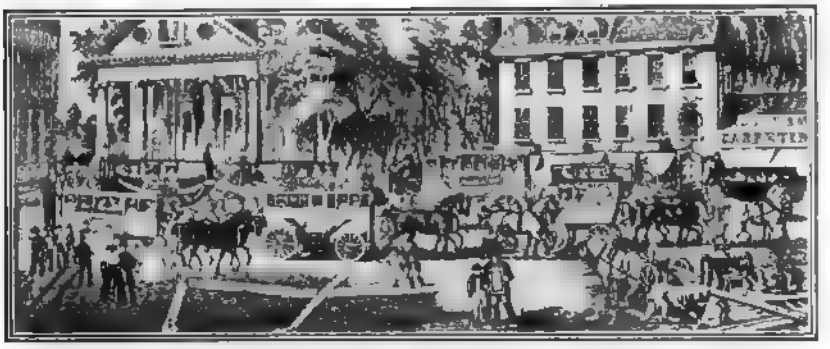
That there were free riders on stages we may safely assume, although no specific mention has been made. But as far back as September, 1654, the following announcement was published:

"No one shall be allowed to ferry between New York and Brooklyn without a license from the magistrates. The ferryman must keep proper servants and boats, and a house on both sides of the river for the accommodation of passengers, and must pass all officials free.

Ferriage. "The said ferryman shall not be compelled to ferry any persons, cattle or goods, without prepayment, and must not cross the river in a tempest."

To-day our Rail Road cars pass both over and under the river.

The law fixed the rates, which were: "Wagon and two horses, $1.00; wagon and one horse 80 cents; an Indian 30 cents, and any other person 15 cents." Why this discrimination against the red man, does not appear.



BROADWAY, NEW YORK, 1831.

The people around New York, as they plodded their way along a century ago, had no dream of the underground and elevated Rail Roads that would come with the general growth of the city.

The Farthest North. When they built the City Hall in New York, on what was considered "the edge of town," they made three sides of marble, and the fourth or north side of brown stone, because they believed no one would ever live above it. To-day several millions of people live in the 15 miles of city stretching to the north of the City Hall.

What a barrier the mountains were before the days of the Steam Road may be gathered from this: when what is now the Reading Iron Company built its first plant, the engine was constructed in Pittsburgh; it was sent down the Ohio River and then by way of the Mississippi to New Orleans, around Florida to Philadelphia and up the canal to Reading.

Franklin's Idea. Little more than a century ago, it was suggested to the wise old Benjamin Franklin that he start a newspaper in New York. Even he did not grasp the great future of our country, for his reply is said to have been that "there was a paper in Boston already, and as they had one in Philadelphia also," he could see no reason for trying to start one in New York. How could one succeed there with so much competition? Not long ago, in New York City, the writer was offered the Sunday afternoon paper published on that day in Philadelphia, three hours after it came off the press.

Conditions in the Central North.

One hundred and twenty-five years ago, eastern Ohio was still in the Northwest Territory. The Western Reserve in Ohio, settled in the latter part of the eighteenth century by emigrants from Connecticut, was the borderland of civilization, although only some three hundred and fifty miles from the Atlantic coast.

Natural Transportation.

Transportation or carriage to this region, supplementing that by man on foot or perhaps on horseback, only existed to the extent of canoes, or their equivalent, on the Hudson, thence to the Mohawk and its headwaters, through Oneida Lake and by portage to the rivers running north and west.

New York, unlike Virginia and Pennsylvania, constructed no great turnpikes to this Western region. Road transportation, save in certain parts of the year, was, and still is, difficult and expensive, if not almost impossible, between the eastern borders of New York and Ohio.

A Hundred Dollars Per Ton.

The cost of early transportation from the Lakes to New York City, can only be approximated. Early records tell us that the Erie Canal reduced the cost per ton "from one hundred dollars to ten."

How many products of the United States are now worth as much as even the cost of freightage of those days? What could bear those early transportation charges? At this rate it would cost $3.00 per bushel to transport wheat between these points and $2.80 for corn.

TOWING A RAFT ON THE ST LAWRENCE.

Reckless Speed.

It might be recited how, upon the improved water way, the Erie Canal, a speed of two to four miles an hour was reached. This rate could be maintained night and day, as the "engine room" of the canal boat, the stable which it carried in the bow, usually had an extra span of mules or team of horses, so that while one team or span was working, the other might rest and feed.

On the Erie canal, 1840

It may be gathered what the speed must have been by canoe, on foot or even horseback. When the time for traveller and steed to stop for rest and refreshment, and the cost of supplies consumed on the way are taken into consideration, the cost of transportation and the cost of the necessities of life to those living in the interior, beyond the food raised by themselves, may be surmised.

Napoleon's Death.

How unprogressive and benighted by our measure were the days even of 1821 can hardly be impressed more forcibly upon our minds than by the slowness with which news then travelled.

A most interesting example is furnished by the "Plowboy and Journal of Agriculture," published at Albany, N. Y., which announced on Saturday, September 8, 1821, for the first time:—"Official intelligence has been received of the death of Napoleon Bonaparte on the 6th day of May of last year. His disorder was a cancer in the chest."

How Our News Travels.

Thus this news of world-wide moment was sixteen months in reaching our public, while the news of Shackelton's exploration "farthest south" in 1909 was around the world in little more than 15 minutes after it was filed in a cable office in a far-off corner of the earth.

Utica to Chicago.

In 1846, sixty-five years ago, a lady wrote of her trip from Utica to Chicago, on the way to the then almost unknown territory of Iowa, as follows:—

"As the shades of evening fell, I must confess to a little feeling of loneliness and homesickness for the old home and friends. Still, the separation does not seem so very great, after all, and the distance appears to have been annihilated by these modern improved means of transportation."

By canal from Utica to Buffalo, and thence by lake "propeller" steamboat, her journey consumed fourteen days. To-day the distance may be covered in thirteen hours and fifteen minutes. Even the minutes are now valued.

The Southwest in Early Days.

Gloomy Prospects.

De Tocqueville described the region from the Mississippi west to the Pacific coast as "a mighty desert." Washington Irving, who made a journey into the Southwest, painted a picture of darkest hue, likening it to "the wastes of the ocean or the deserts of Arabia." He predicted that, like them, it would "ever remain subject to the depredations of the marauder."

The Southwest was cut off from access to the Pacific by the Rockies and the Sierras, then insurmountable barriers.

Expense of No Roads.

Before the construction of our Pacific Roads, it cost the United States a million dollars a year for freightage for each of the seven regiments of soldiers stationed in the Southwest and toward the coast. This sum alone would pay interest on $200,000,000 at 3½ per cent, more than the first cost of the Union and Central Pacific Rail Ways.

Early in the nineteenth century those who had settled in the Missouri Valley, were burdened with an excess of products, and sought a market more accessible than that beyond the Mississippi.

Land of Cliff Dwellers.

"An interchange of commerce with Mexico would result, could a trail be established from the Missouri toward the land of the Cliff Dwellers and into the territory bordering on the ancient country of the Aztecs."

As late as seventy-five years ago such settlements as existed outside of those on the Atlantic coast were scarcely more than mere dots in the wilderness. Nowhere did they touch the eastern settlements, a barrier of difficult mountainous country, at least a hundred miles broad, lying between; a vast stretch of country also

THE SANTA FE TRAIL AS IT IS TO-DAY

was between them and the Mississippi Valley, where a few pioneers had settled along the banks of the Father of Waters.

Rapid Progress.

Starting from St. Louis, a few traders with pack mules had essayed the passes westward with such success as to embolden them to organize wagon trains. These were introduced in 1822, when twenty-five wagons were started, carrying merchandise worth nearly $30,000. Fewer obstacles were encountered than in any similar enterprise previously undertaken in the United States, owing to the largely treeless country, lack of streams and barrenness of much of the region. Traces of this road are still pointed out to the transcontinental traveler as the "Great Santa Fe Trail."

It took 110 days to make the round trip between the Missouri River and Santa Fe, a distance of 800 miles each way on that trail. The trip is now made in less than one fourth as many hours, practically one day over the Steam Road, which has wrought such a wonderful change in this region.

A HOUSE RAFT AND THE BANKS OF THE MISSISSIPPI, 1816.

IN THE MISSISSIPPI VALLEY.

Boating on the Mississippi and Ohio.

The Father of Waters. The Mississippi and Ohio Rivers early became the highways of an unorganized but increasing travel and commerce, which began at Pittsburgh and might end anywhere. Pittsburgh was then a small town of boat builders.

The first craft was the canoe of the Indian. This was followed by the pyrogue, a large double canoe, and the frontier, French, style of boat, carrying a ten or fifteen ton cargo.

Development of Boats. The skiff, a cheaper craft, was later built to carry up to ten tons burden. Then came the wide waisted, sharp pointed bateaux of the French trader, and the ark, a sort of awkward house boat.

Later, there were keel-boats, broadhorn boats and barges; the latter still are in use and are towed by steam boats. Some of the barges, carrying fifty to sixty tons, were manned by crews of from twenty to thirty-five men.

Pittsburgh to New Orleans. A family record shows that as late as 1805 it took nearly three months to go by boat from Pittsburgh to New Orleans; the craft practically floated down the current, tying up at night on account of unknown or shifting channels. It took fifteen days to go from Pittsburgh to the mouth of the Ohio.

"Riding and Hitching." After having floated to New Orleans, the boatmen would walk back or two boatmen would sometimes buy one horse between them for the return journey. In the latter case, one man would ride ahead of his companion, and leaving or hitching the horse at a prearranged station, would walk on; the first man when he came up,

would take the horse and ride on, passing the first rider, leaving the horse and continuing his walk; thus alternating, they made their journey. From this originated the familiar term of "riding and hitching."

The trip could be made all the way by horse a little quicker, but the chronicler of the time says it was "full of danger from highwaymen."

The Battle of New Orleans.

The news of the battle of New Orleans on January 8, 1815, did not reach Washington until the middle of February, a full month later, yet it was sent by post-riders, in probably the speediest manner possible at the time. In fact, the battle itself was fought 14 days after peace had been declared.

As late as 1817 the whole river commerce from New Orleans was carried on in but twenty barges, making one trip a year.

Upstream Progress.

In 1809 the first boat went up the river. It was a sixty-ton barge, with a crew of thirty-five men, who fastened ropes to trees or stakes on the bank and warped and snubbed it up the Mississippi, Ohio and Cumberland rivers to Nashville. Is consumed ninety days in the journey.

A KEEL BOAT IN THE FUR TRADE, TOWED BY HUMAN POWER, 1810.

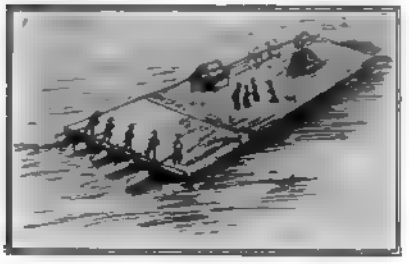
Thereafter, two barges came up annually by the same means. Few periods of our early history are more picturesque or interesting than the period of early flatboating on the Mississippi. Lincoln's reminiscences furnish some interesting accounts of this primitive mode of travel, he himself having been a flatboatman. He aided in building and operating several in which he floated down the Mississippi He invented and patented a device for lifting boats over the shoals, a model of which is in the National Museum at Washington.

Lincoln's Dollar a Day.

When Lincoln was on his first trip down the Mississippi, selling produce from a hand-made scow, he received a dollar for putting two passengers on a passing steamer. He said many years later:

"I could scarcely believe my eyes. I could hardly believe that I had earned a whole dollar in one day. The whole world seemed fairer before me."

Such were the conditions with which our fathers had to content themselves before the days of Rail Roading, only a little while ago. Wages ranged from $15 to $18 per month in this region.



A RAFT ON THE MISSISSIPPI

A MISSOURI STEAMBOAT RUNNING THROUGH A BUFFALO HERD.

EARLY CONDITIONS AND MEANS OF MOVEMENT IN THE SOUTH.

Search among old records reveals some fascinating facts, not generally known, regarding the early days and travel in the Southern States.

Primitive Carriage.

At this period the people who grew tobacco in North Carolina, rolled it to Petersburg, Va., to be marketed, light wheels being attached direct to the hogsheads. Those who grew corn generally fed it to hogs and drove them on foot to Philadelphia or Charleston. This was an ingenious solution of the problem of transportation without vehicles. Wheat was ground into flour and sent by wagon to distant markets, a distant market in those days meaning one from fifty to a hundred miles away.

Little Waste.

"The corn not fed to the swine was distilled into whiskey and the fruit into brandy, that which escaped the throats of the neighborhood drinkers being peddled along the road to rural consumers or sold in bulk to village shops." This custom was in direct violation of all the rules of political economy, for each man was at that time an agriculturist, manufacturer, transporter, wholesale and retail merchant, and a voracious consumer.

At this period probably the only post office in the whole state of North Carolina was that at Tarboro.

News Gatherers.

The wagons returning from market which brought back sugar, shot, powder and molasses, were the only source of information, the news from the old world and sometimes from other parts of the United States thus reaching the inhabitants, perhaps not more than three months old.

Boone's Trace. The first road between North Carolina and Kentucky was made by Daniel Boone; it was and still is called Boone's Trace. Only parts of it remain.

Boone followed the trail made by the buffalo in their pilgrimage from the east to the salt licks of Kentucky, which region he named Transylvania. First it was merely a trail, then a bridle path, and later trees were cut down and some semblance of a road hewn through the wilderness, so that wagons might get over it.

An Affectionate Road. A story is told of a road in those days, which, while facetious, is probably only an exaggerated picture of real conditions. This road, it is related, during the winter "grew so soft that a blanket spread upon it sank at once out of sight," and "a knitting needle stuck into it could not be pulled out by a team of oxen, so tenacious was the mud."

VIRGIN CONDITIONS ON THE FLORIDA COAST

In 1800, in the Northern States, four miles an hour was the average speed for a coach between Bangor and Baltimore. South of the Potomac the roads became steadily worse, until beyond Petersburg even the mails were carried on horseback.

The Joy of Traveling. The stages, naturally, did not travel paths of roses. "When the maximum stickiness of the road was reached, in order to get the mail through, the stage would be taken apart, and a box fastened to the front wheels, with a seat for the driver and one passenger. Four strong horses were attached and they would pull through at the rate of two to three and a half miles per hour." This would hardly be described as "joy riding."

Special teams would take four passengers from Raleigh to Chapel Hill, thirty-six miles, and charge six dollars each, or about 16 cents a mile, probably losing money at that, according to the annals of the time.

It took Governor Pinckney six weeks to drive his own team from Charleston to Philadelphia, at an expense of no less than $420.

Washington's Tour.

When Washington journeyed through the Southern States, while he was President, he used his own horses, probably because he felt that he could not always depend upon securing others. The trip covered eighteen hundred miles and consumed about three months. Presidential candidates, though making frequent stops to indulge in oratory, have covered an equal distance in two or three days.

EN ROUTE IN COLONIAL TIMES.

President Washington was unable to average more than twenty miles a day; modern men cover three times that distance an hour. At no known rate of travel, could Nashville then be reached in less than a fortnight or three weeks travel from Philadelphia.

Expensive Shipping.

In South Carolina it cost $40 a ton to carry goods one hundred miles, about two and one-fourth times as much as some classes of goods could now be transported for, all the way from the Pacific States to Hamburg, Cherbourg, Liverpool or Amsterdam, the latter distances varying from 6,000 to 7,000 miles.

Later, the longest plank road in the world extended from Fayetteville to Bethania, N. C. The average load which could be hauled upon it was 3,500 pounds, while 2,000 was the average load on dirt roads. In the country in those days a two-horse farmer's team was practically unknown, as only teams of four to six horses could haul a load of any size over the roads.

How Fast News Travelled.

It took from April 19, 1775, to May 8, nineteen days, for news of the battle of Lexington to reach Wilmington, N. C., by messengers riding night and day, post-haste.

General Washington recited, in a communication to a friend, that he had received a letter which had been in transit two weeks in going from Trenton, N. J., to Mt. Vernon, just south of Washington.

Water's Pre-eminence.

During the period comprising all of the eighteenth century, and a goodly portion of those immediately preceding and following it, the highways, such as they were, were used but little for the transportation of freight, which was shipped for the most part by water. Where there was no water there was little trade.

IN THE WEST AND NORTHWEST.

Overland to Oregon and California.

In our Lifetime.

George T. Himes, of the Oregon Historical and Pioneer Society, now alive and in robust health, in a letter addressed to the writer, under date of October 21, 1908, said: "I am reminded that this is the anniversary of the closing day of a seven months journey to Oregon with ox teams in 1853, our little company of seventeen men, women and children starting at Lafayette, Stark County, Illinois, on March 21. I walked the whole distance, there being no sentiment in riding behind an ox team."

Fifty years earlier, but little more than a century ago, it took Lewis and Clarke eighteen months to make the trip from St. Louis to the Pacific Coast—now made in three days, one day of modern travel accomplishing what six months did in the early days.

The early settlers in Oregon were mainly retired hunters and trappers, with a scattering of missionaries.

First Settlers.

The first general overland emigration was in 1843. A large party gathered from Ohio, Iowa and Illinois assembled at Independence, Mo., and started westward. Other groups joined the main party, until there were 120 wagons, and nearly 1,000 persons of all ages, trades and professions. More than five thousand animals belonged to the train, which was divided into two sections.

The march was carried on in a military manner. Sentinels awoke the party, by discharging their rifles, at four o'clock in the morning, and at seven the procession started. There were fifteen divisions of four wagons and sundry animals each. A borderer familiar with the country led the way. Advance riders went ahead and selected a suitable place for the noon meal, where dinner was prepared and animals fed, but not unyoked.

At the end of the noon hour the journey was resumed. About sunset the halt for the night and laager of the wagons and outfit were made.

At Snail's Pace.

On entering the Rocky Mountains travel became difficult, and the order of march was partly given up. It required something over three months for the party to reach Fort Hall, on the eastern border of the mountain country. Many difficulties had been encountered from straying cattle, violent tempests and swollen streams, but their greatest

troubles began after two-thirds of the journey had been accomplished.

Tortuous Travel. Thus far they had followed a well-known trail. From this point no trail had been broken; small parties had formerly left their wagons here, but this was impossible with so many women and children. They pressed on with the foot-sore oxen, passed Fort Boise, and after encountering terrific storms and going over rough and stony roads, finally reached a mission station on the Columbia River, and there purchased new supplies, as many were in dire need of food.

A few days later they moved on again and in due time reached the Willamette River, their destination.

EMIGRANTS CROSSING THE PLAINS

A PRAIRIE SCHOONER.

To California. The next large party, in 1845, had 600 wagons and was composed of 2,500 persons. All crossed the Rockies in safety, but at Fort Hall 65 wagons turned off to California. The main party went down the Snake River.

At Fort Boise, 150 wagons followed a guide who offered to lead them over a new route. The road was desolate and barren, cattle died for want of food and water, 75 persons perished, and the rest arrived forty days after those who had followed the regular route.

Financial Peculiarities. A peculiar institution of California up to the time of the construction of the Union Pacific Railroad was "steamer day." This fell on the day prior to the departure of a steamer and included a rather complicated proceeding. Each merchant would collect from each one who stood in his debt whatever was owing. Accounts were not balanced; that it, if Smith owed Jones $2,000 and Jones owed Smith $1,500, it would not be settled by Smith paying Jones $500, but each would receive in gold the full amount due, a man with a bag being sent around to make the collection.

In this period a stage line was established from western Texas to the Pacific Coast. The time en route was about thirty days, and

the fare around $500. The cost of the trip from the Missouri river to California was likewise about $500.

Via Lake Nicaragua.

There was still another line, known as the Nicaragua route, which lay part of the way via the San Juan river, then by road to Lake Nicaragua, across the lake by steamer, and thence by pack train or mule to the Pacific.

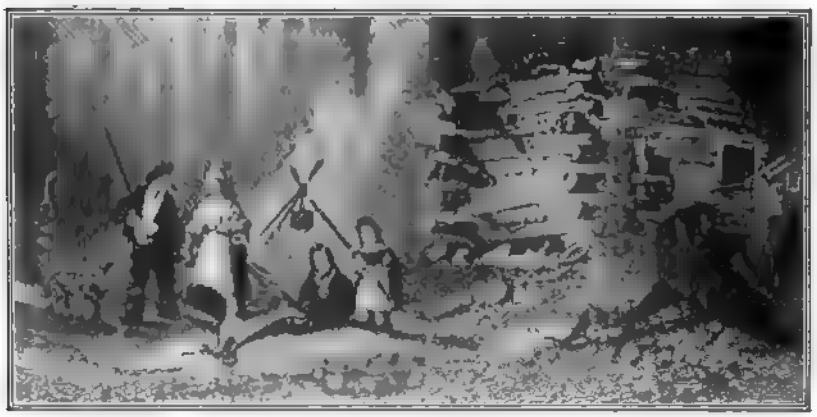
In the fifties, Commodore Vanderbilt obtained a concession from the Nicaraguan government for an inter-oceanic canal, and operated a line of steamers on the lake. The time via this route was about six weeks and the trip cost approximately $500 in gold.

Around the Horn.

George Carragan, President of the First National Bank of Bayonne, New Jersey, tells of his interesting experience on a trip to California around Cape Horn in 1860. They lived on salt food. The food on Monday of each week was always the same as on the previous Monday, and all the Mondays to come. It was the same with every day of the week. He writes: "On Tuesday we had salt beef, which I assure you required good teeth to chew, potatoes and hard tack. The hard tack was about six inches in diameter and so hard that we could strike it on the deck without breaking it."

Then and Now.

The only fire on board was for cooking purposes, and when the passengers were cold they had to retire to their bunks for warmth. Mr. Carragan remarks that the trip he made in 1901 across the continent in a parlor car, in the comforts it offered him, is almost beyond comparison with the first one. The early trip consumed 170 days. It can now be made in four and a half days.



SETTLERS IN THE FOREST

General Conditions During Jefferson's Administration.

The Line of Progress.

Though four hundred years have elapsed since the discovery of America, the building of our nation, with the assistance of the great transporting medium, really began eighty years ago.

Before 1800 the methods of transportation on land were in many respects those in use at the dawn of civilization. The emigrant from the Atlantic slope to the West moved with his family and herds much as did his ancestors in the old world, thousands of years before; the only traffic he maintained with civilization was the irregular exchange by which in return for pelts and furs he secured weapons and ammunition and a few coarse supplies.

Three Hundred Years.

It had taken from 1492 to 1800 for the population of the United States to reach 5,208,483, one-fifth of whom were negroes, while the valuation of the United States was about $1,100,000,000. Wages of skilled labor averaged a dollar a day.

The center of population rested within eighteen miles of Baltimore, practically on the Atlantic coast. In 1760, Lancaster, Pa., forty miles west of Philadelphia, was spoken of as "in the far west." Adams says in his "American History:" "During the first administration of Thomas Jefferson, even after two—we might say three centuries—the land was still untamed. Fifty or a hundred miles inland more than half the homes were log cabins, which might or might not enjoy the luxury of a glass window." In passing, it may be noted that in 1809 Abraham Lincoln was born in such a log cabin without a glass window.

THE CABIN IN WHICH LINCOLN WAS BORN.

A JOURNEY ON HORSEBACK

A Thousand Years Naught.

"The Saxon farmer of the eighth century enjoyed the same comforts and lived about as well as the farmer and pioneers of the United States did in the eighteenth century." The lack of progress allowed both to enjoy only a minimum of comfort and prosperity.

"Except in political arrangement, the interior country was little more civilized than in 1750, and was not much easier to penetrate than when LaSalle and Hennepin found their way to the Mississippi more than a century before.

Roads Nil.

"The same bad roads or paths and difficult rivers, connecting the small towns, stretched into the forests in 1800 as when the armies of Braddock and Amherst pierced the western and northern wilderness to Pittsburgh or Fort Duquesne.

"Nowhere did eastern settlements touch the western. At least one hundred miles of mountainous country held the two regions everywhere apart. The shore of Lake Erie, where alone contact seemed easy, was still unsettled.

The Start of Improvement.

"A great exception broke this rule. Two wagon roads crossed the Allegheny Mountains in Pennsylvania, while a third passed through Virginia, southwestward, to the Holston River and Knoxville in Tennessee.

"Even by water along the seaboard communication was as slow and almost as irregular as in colonial days. The voyage to Europe was comparatively more comfortable and regular than the voyage from New York to Albany."

Of eight rivers between Monticello and Washington, Jefferson wrote: "Five have neither bridges nor ferry-boats."

How Important Are Roads.

Adams says in his book, to which reference is made above: "If America is to be developed along the lines of water communication alone, by such means as were known to Europe, Nature has decided that the experiment of a single republican government must meet with extreme difficulties. By water an Erie Canal was already foreseen; by land, centuries of labor could conquer those obstacles which Nature permitted to be overcome.

"No matter how good the road, it could not then compete with water, nor could heavy freights in great quantities be hauled on land for long distances without extravagant cost."

BRADDOCK'S BATTLEFIELD, NEAR PITTSBURG

An inclined plane on the Imperial canal, China.

SECTION V.

ARTIFICIAL WATERWAYS.

America's First Improvement in Transportation.

Essential to the development, progress and prosperity of any new country are highways, whether on land or by water. Lacking other routes, or hampered by forests, American pioneers followed the only natural ones, the water courses. These were the only roads permitting even moderate facility in travel.

Bettering Transportation.

But with the country's growth, more and better routes became indispensable, particularly in the great interior valleys. Settlers began to develop our national resources, and better transportation means were essential for this purpose.

The mouths of the Rivers St. Lawrence and Mississippi were too far from the seats of population and commerce, and "were held by foreign and unfriendly powers." Hence, communication between settlements within the Great Interior Basin of the Ohio with those nearer the coast, across the intervening mountains, became of momentous importance.

A Waterway Proposed. The shortest distance between the Atlantic and the inland streams is across Virginia. Moreover, settlements penetrated thence toward the inland earlier than elsewhere. Hence, it was soon proposed to unite the inland and tidewaters by means of canals through this region.

When Washington was but a young man his practical mind realized the importance of intercommunication, and his knowledge gained in land surveying made him more familiar with the Potomac headwater region than any other public man of his time.

PROPOSED INTERCOASTAL CANAL.

CANAL BOATS WITH INCLINED PLANE IN THE DISTANCE

Washington's Plan. He saw the need of binding together our domain and making the Atlantic ports the outlet for our exports. In his exploration he constantly sought navigable water from Chesapeake Bay to the Ohio River. Before the war he had already urged the Virginia House of Delegates to begin provision for transit across the province. He made an extended exploration of New York in search of some such navigable water line.

Lincoln Follows. Lincoln, nearly a hundred years after, took the same stand for advanced transportation to tie the different parts of the nation together.

As stated in "The Winning of the West," it was Lincoln who insisted on, and finally brought about, the building of the Union Pacific Rail Road.

Thus both of these great presidents stood for the advancement and fullest development of transportation. It would seem worth while to consider their precepts, the wisdom of which has stood the test of time.

Washington's Wisdom. Washington almost prophetically said: "I could not help taking a more extensive view of the vast inland navigation, and could not but be struck with the immense diffusion and importance of it. Would to God we may have wisdom enough to improve them."

Washington saw that the plain between the Hudson and Lake Ontario streams would be the highway for future commerce—that here could be realized for the nation the benefits which, through building a canal along the Potomac or the James, it was hoped to obtain for his own state.

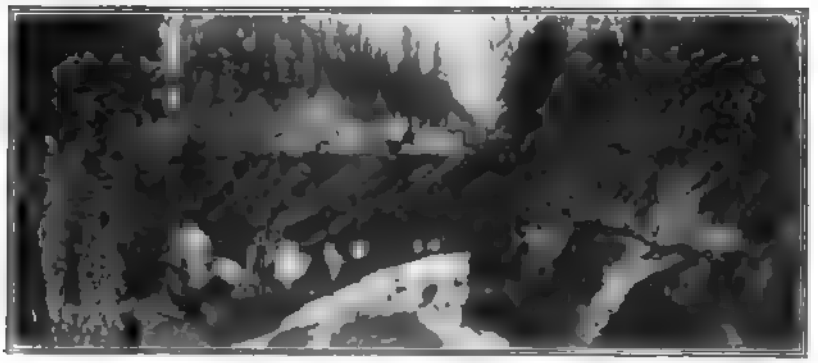
The Prophecy of Our First President.

Actual Steps. War at an end, Washington resumed the subject of water communication between the Chesapeake and the Ohio. A charter for a canal was procured from Virginia and Maryland, and a company was formed, of which he was the first president and in aid of which he secured valuable grants of land and money. He made another inspection of the proposed route, and reported his conclusions, in brief, as follows:

Fears Loss of Middle West. "The flank and rear of the United States," he said, "are possessed of other powers....and it is necessary to bind all the parts of the Union together with indissoluble bonds—especially that part which lies immediately west of us....For what ties should we have upon these people....if the Spaniards and Great Britain....should hold out lures for their trade and alliance? What....will be the consequence of having formed close connection with those powers in a commercial way?

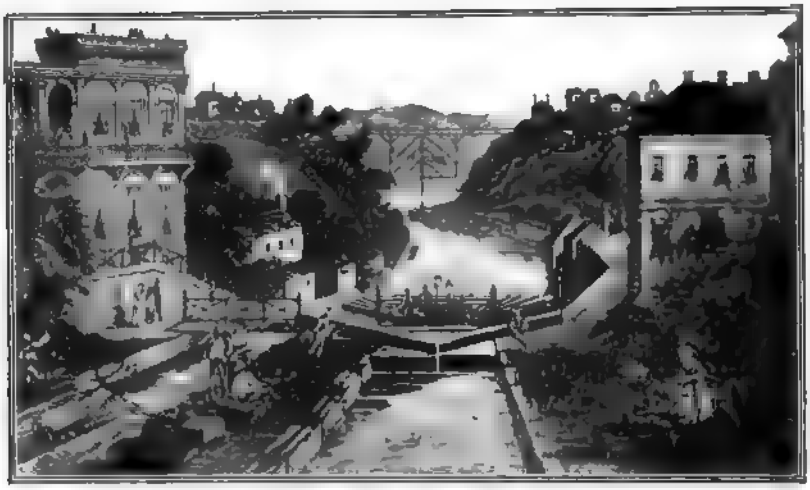
Advises Development. "The western states hang upon a pivot. The touch of a feather would turn them any way. Certain causes have hitherto checked the industry of the present settlers; for except the demand for provisions, occasioned by the increase of population and the little flour which the necessities of the Spaniards compel them to buy, they have no incentive to labor.

"But smooth the road and make easy the way for them, and then see what an influx of articles will be poured in upon us, how amazingly our exports will increase, and how amply we shall be compensated for any trouble and expense we may encounter to effect it."



THE ERIE CANAL CROSSING THE MOHAWK RIVER, 1840

Fulfilled. It is difficult to find a prophecy more completely fulfilled, or any section of the world which has produced a larger variety and greater number of articles, or so amply compensated for the trouble encountered to effect its possession. The trade with the few Indians with their small and



LOCK AT LOCKPORT ON THE ERIE CANAL

primitive wants, has been replaced by a trade with millions of white men, having many and varied wants.

New York's Canal. In 1792, New York incorporated the Western Inland Lock Navigation Company, with authority to construct "lock navigation" between the Mohawk and the streams flowing into Lake Ontario.

The company constructed a canal around Little Falls. In 1802, a route capable of passing boats of fifteen tons burden was opened from the Oneida to the Lower Mohawk. The canal portion was small and so imperfectly constructed as to be of little value. When the Erie Canal was undertaken the company was glad to sell the works to the state for about one-quarter of their cost.

Enter the Erie Canal.

A Good Result. Yet this company's work was valuable in that it led to the construction of the Erie Canal. It is remarkable that this company itself never thought of opening a way to Lake Erie. Freight destined for the west was sent by way of Lake Ontario to the mouth of the Niagara River. To the head of the falls was a portage of twenty-eight miles; the charge for carrying a bushel of salt around it was seventy-five cents; for a ton of general merchandise, ten dollars. For this sum to-day the average ton of freight can be carried 1,200 miles—from New York to St. Louis.

Erie Idea Develops. The works of the Western Inland Lock Navigation Company proved wholly inadequate. The war of 1812 brought sternly home to the people the necessity for internal means of communication. New York, therefore, determined to construct at once a canal connecting the Hudson at Albany with Lake Erie at Buffalo.

It was not until 1825, or sixty-five years after the first lock canal of France, that we had our first canal, the Erie. To celebrate the opening, cannon were fired; and their reverberations, repeated by other pieces placed at intervals, telegraphed the news, as it were, in one hour and twenty minutes to the city of New York.

Its Capacity. The canal was originally 40 feet wide and 4 feet deep, with locks 90 by 15 feet. It was capable of passing boats of 60 tons burden. It has since been enlarged, and is capable of passing boats of 240 tons. Yet it would not to-day carry more than one or two per cent of the total traffic to the Atlantic seaboard, and we can see how our commerce, our great cities and their growth, would have been hampered had this remained the interior's only means of communication with the Atlantic.

Other Canals.

The opening of the Erie Canal gave an impulse to the construction of similar works.

$250,000,000 in Canals. The Western states constructed waterways, to connect with the Erie Canal through the Great Lakes. Private companies also made investments in this direction. Within fifteen years 8,500 miles of canals, costing about $250,000,000, were constructed, chiefly in New York, New Jersey, Pennsylvania, Maryland and Virginia.

Though of great advantage to the sections traversed, these works were not of permanent value, with the exceptions of the Erie, 387 miles; Delaware & Raritan, 60 miles; Delaware & Hudson, 108 miles (abandoned in 1899), and the Chesapeake & Delaware, 50 miles. Only a small percentage of the canal mileage ever paid the investors, who lost, as a rule, every dollar they put into them. The Delaware & Raritan and Chesapeake & Delaware are practically small ship canals, and will pass boats under steam capable of plying the bays and inland waterways of the country.

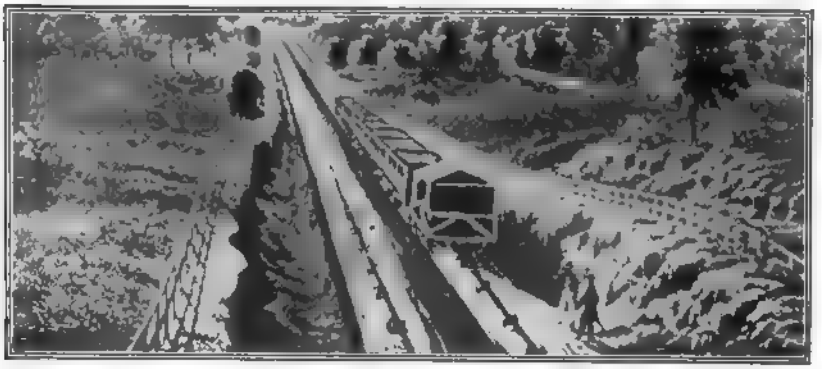
The Failures. It was found physically impossible to carry some of the most important plans to completion. Only the Erie Canal ever crossed the divide and connected with the western waters.

AN INCLINED PLANE, P & R RAILWAY, NOW USED FOR COAL CARS.

Pennsylvania undertook a canal from the Delaware to the Ohio at Pittsburgh, but want of water at the summit of the Alleghenies made necessary a 40-mile link of Rail Road. Maryland found herself unable to extend her great Chesapeake & Ohio Canal beyond the base of the mountain at Cumberland; the same reason also frustrated Virginia's pet plan, the James River & Kanawha Canal.

Ohio constructed two small canals from the Ohio River to Lake Erie, one from Portsmouth to Cleveland, and the other from Cincinnati to Toledo.

Roundabout. From Cincinnati, Southern Ohio and Kentucky, using the Erie Canal meant that freight first went north to the Great Lakes, then east by barge or vessel to Buffalo, then farther east to the Hudson, and thence south to New York. It was like going around three sides of "Robin Hood's barn," because the short, direct way across the mountains could not be followed.



THE INCLINED PLANE AT BELMONT, PA., 1840.

After repeated failure Indiana constructed from Evansville to Toledo a work similar to those in Ohio. Illinois built one from Lake Michigan at Chicago to the waters of the Illinois River, and the waters of the Great Lakes now flow through the drainage canal and finally reach the Gulf of Mexico.

The Chesapeake & Ohio Canal. The Chesapeake & Ohio Canal cost $60,000 per mile, and the canals across the level prairies of Ohio and Indiana as low as $20,000 per mile. The cost, therefore, sometimes equals that of a Rail Road, but we should not forget the much greater carrying capacity, speed and economic value of the latter, and that equipment and means of locomotion are included in the cost of the Steam Road.

The canals and waterways did not last long after the Rail Ways came, for 1,900 miles of canals were not paying expenses by 1851. The average speed of the two or even four-horse power canal

boat was then, as now, about two miles per hour, including the time consumed in passing through the locks.

Inadequate Facilities.

These works for a time served a highly useful purpose, but they were by no means equal to the demands of commerce and of travel. They were not navigable in winter and even in the remaining seven months traffic was constantly liable to interruption, just as is that on ordinary roads.

Moreover, only muscle power, feeble and unenduring compared with steam, was employed upon them. The construction of canals, consequently, ceased as soon as the speed and economy of Steam Road transportation were thoroughly demonstrated.

AT A CRITICAL PERIOD.

Enter the Rail Road.

Rail Roads the Awakeners.

The internal business of the United States had outgrown in turn the canoe, the flatboat, the turnpike and the horse-drawn canal boat; the clearings of the pioneers were waiting for the plough; in other sections grain was rotting for lack of market; the impatient spirit of progress, restive under its limitations, awakened the young giant, America, to gradual realization of the bonds and oppression of inadequate means of carriage and confined or laggard transportation at practically prohibitive costs. At this, the psychological moment, there entered the Rail Road, to accomplish the full awakening.

Then the real progress and prosperity of the union began. Instead of money going into shipping and water transportation enterprises for the development of foreign ports, lands and countries, it was turned into a business at home.

The result was startling; the building of our inland empire following the development of advanced land transportation was stupendous, and the Steam Road and commerce became inseparably knitted to progress and prosperity.

The Outgrowth of Rail Roading.

We may well ask ourselves how could have come the great development of our interior states without the Railed Roads. They brought a thousand and one industries which were primarily created or made possible by them. These required, as did all industries, quick, cheap and far-extending transportation, in order that their products might reach the world's markets as well as our own widely separated points of consumption.

By careful study, through elimination, by division of and specialization in operation, have come the building up of both the mechanical and human organizations of the splendid Steam Road structure which has meant so much to the nation.

Turning Capital from Sea to Land Carriage.

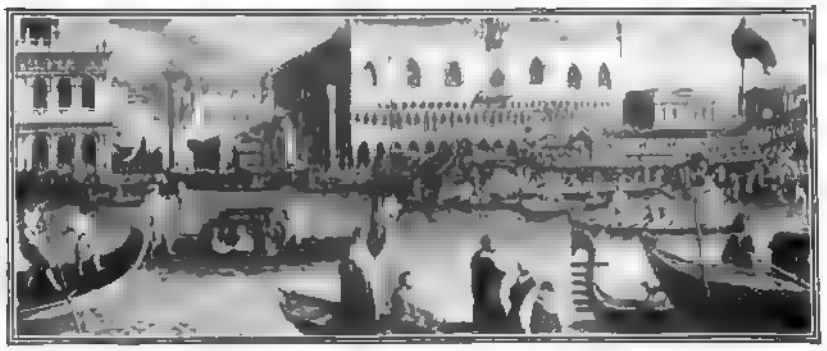
A Retrospect. It was not a great transition for private capital that had been engaged in profitable sea transportation to turn to land transportation, so long as it promised equal remuneration to the investor. For centuries before the Railed Roads were introduced men built ships to transport their own warēs and those of others. These were the great means of international intercommunication before the Rail Roads came, and of coastwise traffic between the Atlantic ports of the country.

As commerce grew, ships increased in size and trade extended, and then the ship owners began to turn their energies to freighting on land as a matter of necessity to bring cargoes to their ships. Later, they began to freight on land as they had on the sea as a purely commercial enterprise.

Limited Land Facilities. The sea was every man's road; it charged no toll. But only such land or places as were adjacent to the sea or navigable water could be reached, and as population increased land so favored became valuable. The enterprising producer sought other and cheaper lands that might grow in value, thus making new fortunes, small or great. Thereupon land transportation to bring products from distant points to seaports became the need of the hour.

Combination. The organization of the earlier shipping companies was like that of any other business. Managers of transportation lines, when business outgrew their own means, invited outside capital and increased their facilities. The thrifty began to find that merchants and ship owners made money and that investments in ships paid better than in many other things.

Sometimes a single voyage would return a profit as large or almost as large as the cost of the vessel. Our merchant marine, at the time of the civil war, was the second largest that ploughed the seas, because of the wide diffusion of this class of interest and investment.

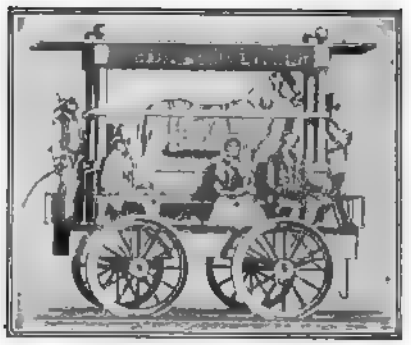


THE CANAL, VENICE.

Early Broader Transportation.

In the early nineteenth century, especially, the trading ship business throve. Shares in the vessel or cargo were sold, and the company consisted of various shareholders, whose deeds or certificates of ownership in the vessels or their contents were sold and traded in, as are Rail Road company shares to-day.

In the early packet ship trade many fortunes had their beginning. Commodore Vanderbilt, as a ship-owner conveying goods by water, gained the money with which he later developed railway transportation. Commodore Stevens, Commodore Garrison and others first owned steamboats, but then went into the Rail Road business. Thus came the diversion of man's energies and capital from transportation by sea to that on land.



THE 'FLYING DUTCHMAN," 1829.

SECTION VI.

THE BEGINNING OF THE REAL NEW WORLD.

The Story of Early Rail Roads in the United States.—Laying the Corner-stone of Modern Progress and Prosperity.—

The Old Order Passeth.

Some years elapsed between the first experiments on the Stockton & Darlington Rail Way and the granting of the first Rail Road charter in the United States.

Our First Rail Road.

The first American Rail Road, a tramway three miles long, was built in 1826 near Boston to carry granite from Quincy to the Neponset River. It was a horse line. The first car on this road looks as little like a modern car as a bicycle. A similar road was built near Chester, Pa., from the quarries of Lapidea Manor to the Delaware River.

A gravity, or cable road, was built the same year from a coal mine near Mauch Chunk, Pa., to the Lehigh Canal; the trains ran down inclined planes by their own weight, and were drawn up again by stationary engines. This line, now owned by the Central Rail Road of New Jersey, is still used in summer for pleasure travel. The Carbondale & Honesdale Rail Road was built in 1827, from the Delaware & Hudson Canal to the coal mines.

An Epoch. These lines were merely repetitions of English tram roads. They are important only as showing the beginning of the use of rail equipped, or Railed Roads, in America.

It was not until 1828 that a Rail Road for freight and passenger transportation was begun. It was conceived by and built in a Southern state.

The First Real Rail Road. This was the first practical step in the construction of an American Rail Road. It was the child of necessity, for the Erie Canal, after it was running smoothly, cut off the trade of Philadelphia and Baltimore from the West, and a canal from Baltimore to the Ohio River had been found to be impracticable. Baltimore merchants, therefore, procured a charter for the Baltimore & Ohio Rail Road, authorizing the construction of an all-rail line from Baltimore to Wheeling, beyond the Alleghenies—in the "Far West" at that time.

ATTEMPTS TO USE SAILS ON ROADS AND RAILS

Animal Power.

1776-1828. Construction began in 1828. The corner-stone was laid by Charles Carroll of Carrollton, the last surviving signer of the Declaration of Independence.

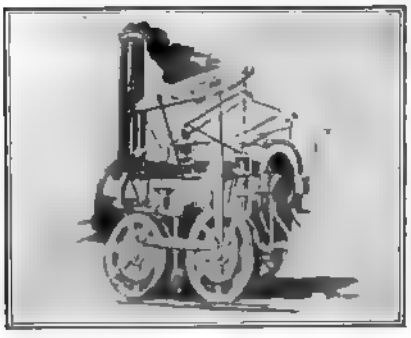
In 1830 the first section, 15 miles, was opened to Ellicott's Mills, the company announcing in the "Baltimore American" that a "brigade of cars" would run three times a day each way, and that the fare would be twenty-five cents.

For a year the Baltimore & Ohio used only horse power. The horses were changed nine miles out from Baltimore, the place being called therefor the Relay House, a name which has been retained to this day. Even up to comparatively a few years ago the cars were hauled across Baltimore by mules.

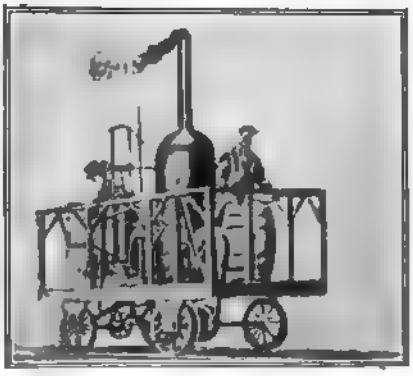
In the early days of Rail Roads in New York City the cars were hauled from the old station near the present Tombs as far as the Grand Central Depot by horses.

The Sail Car. An ingenious, though unsuccessful, attempt was made to propel trains by means of sails. The interest in the experiment was so keen that foreign representatives and other dignitaries went out from Washington to see it.

As the usefulness of steam power was realized, a commission of distinguished engineers was appointed in 1829 to compare the merits of transportation by locomotives and by stationary power. They recommended the latter, suggesting the erection of stationary engines at three-mile distances, the trains to be drawn by an endless rope or chain. German canal and river boats to-day pull themselves along the surface by a chain fastened to the bottom at various points and passing over rollers and sprocket wheels.



THE "STOURBRIDGE LION," 1829



PETER COOPER'S "TOM THUMB," 1830.

Six Tons Unbearable. The first locomotive used in the United States was imported from England in 1829 for use upon the Carbondale & Honesdale Rail Road. It was called the "Stourbridge Lion." This "monster," weighing six tons, was found too heavy for the track. Two or three other engines were later shipped from England.

The "Howard," used in 1830, was the first locomotive built in America; it was designed by a civil engineer in the employ of the Baltimore & Ohio Rail Road, then in its infancy.

Tom Thumb. In the same year Peter Cooper successfully operated his experimental model, the "Tom Thumb." It made its first trip August 25, 1830, running from Baltimore to Ellicott's Mills in an hour and a quarter, a rate of twelve miles an hour. This was the first time that passengers were carried by steam power in the United States. Cooper was followed by Johnson, Milholland, Baldwin, Winans and others, all destined to shine brightly in the constellation of nineteenth century inventors.

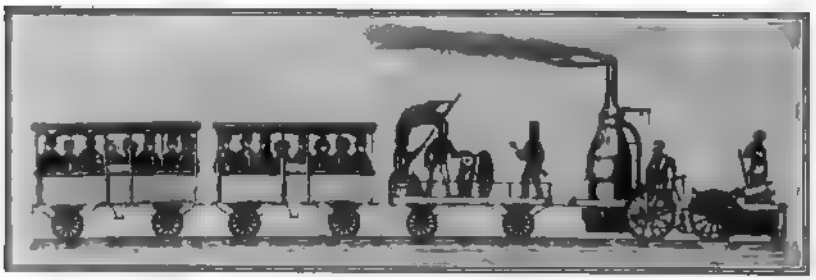
Great Oaks; Little Acorns. The train that made this slow run eighty years ago was the forerunner of our eighteen-hour Chicago-New York expresses. The trial convinced the directors of the superiority of steam over animal power, so that the company, by advertisement, offered $4,000 for

the best, and $3,500 for the second best, locomotive. The locomotive was not to exceed three and a half tons in weight, and was to draw fifteen tons on a level road, inclusive of the wagon, at a rate of fifteen miles an hour.

Three engines were offered to the company; that of Phineas Davis, of York, Pa., was accepted. Although this engine could not climb steep grades, yet it further convinced the Rail Way officers that the use of steam power was advisable.

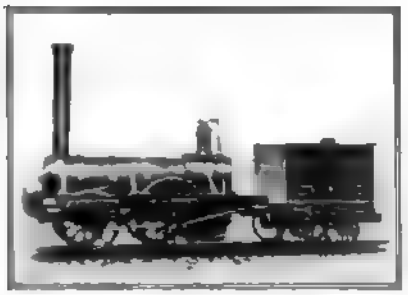
The president of the company, Philip E. Thomas, said that by many improvements made even at this initial stage of development, an immense reduction in the cost of transportation and an increase in speed had been effected.

In 1830 an engine had been built for regular service on the South Carolina Rail Road called the "Best Friend of Charleston." In 1831 another engine was built for the Mohawk and Hudson Rail Road.



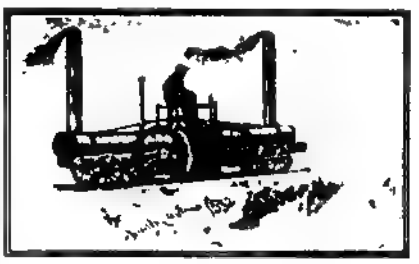
THE BEST FRIEND OF CHARLESTON," 1830

Old Ironsides. The first locomotive built in Philadelphia, and one of the first in the nation, was "Old Ironsides," built in 1832 by Matthias W. Baldwin, founder of the Baldwin Locomotive Works. This locomotive weighed little more than five tons. Yet its success contributed much to the establishment of locomotive construction in this country.



"OLD IRONSIDES," 1832

THE "SOUTH CAROLINA," 1832

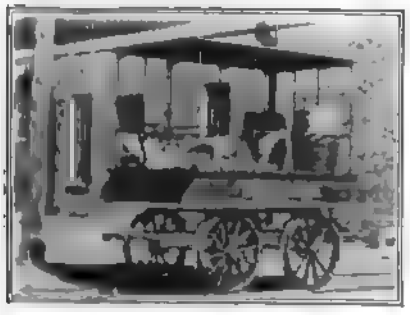


A Contrast. There is a striking contrast between the locomotive now in use and that of 1832. The latter weighed from three to six tons; a modern Mallet compound, with its tender, weighs up to three hundred tons, equal to a string of a hundred of the earliest ones. The old engine was not designed to draw, on a level road, a weight as great as the wheels and trucks of a single modern Pullman car.

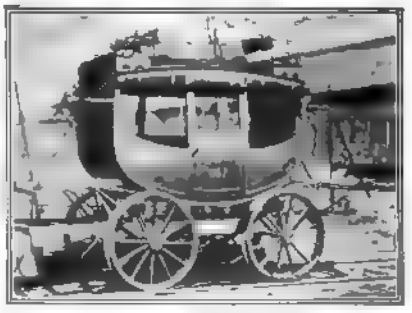
THE "DEWITT CLINTON" TRAIN, ENGINE, TENDER AND THREE CARS ON A SINGLE MODERN FLAT CAR.

Our picture of the De Witt Clinton train forcibly demonstrates the development, showing a whole train, consisting of engine, tender and three cars, mounted on a single flat car, the smokestack of the locomotive, even though loaded on a modern car, being nevertheless only as high as the roof of the adjoining Pullman.

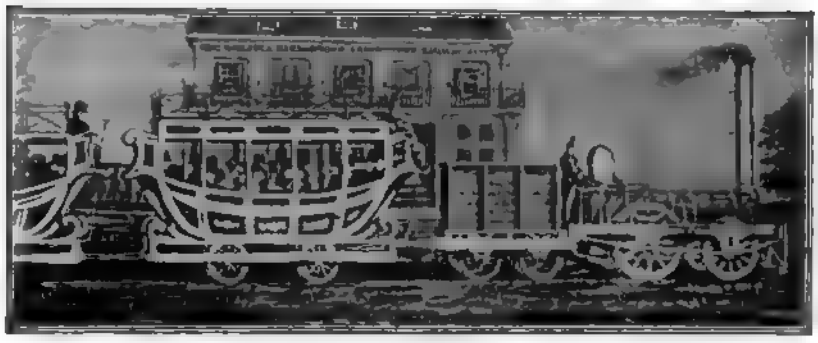
The Flanged Wheel. There were many valuable improvements even in the early days. One was the combined cylindrical and conical car wheel, really the modern flanged wheel, invented by Jonathan Knight.



THE "DEWITT CLINTON" TENDER



THE DEWITT CLINTON COACH.



A Germantown and Norristown Railway train, 1832.

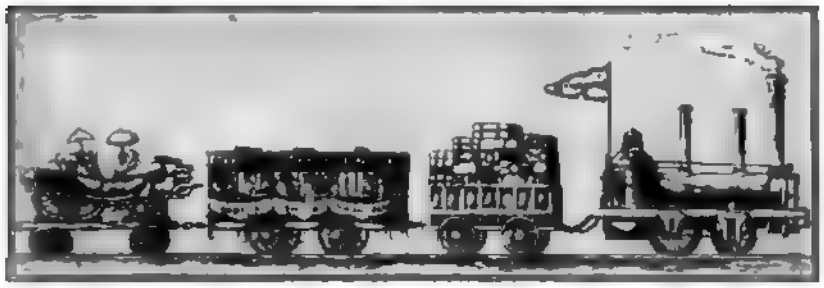
It worked excellently, yet was condemned by many distinguished engineers, who contended that this wheel could not be used successfully in such states as Maryland and Virginia, where the broken character of the ground required too many and too sharp curves.

Among the great inventions of the world the flanged car wheel should not be omitted.

A Patriot's Foresight.

In conclusion, it is well to consider the words of Charles Carroll, of Carrollton, who, at the opening of the Baltimore & Ohio Railroad, realizing the importance and gravity of the moment to the future of the United States, said:

"I consider this among the most important acts of my life, second only to that of signing the Declaration of Independence, if even second to that."



Boston to Worcester, 1835.

POSTILLION DRIVING IN DICKENS' TIME. FROM HIS WORKS.

TRAVEL AND RAIL ROADS IN THE FORTIES.

Dickens' Experience.

The Rail Roads, when they first arrived, were very imperfectly constructed and operated, and for some time consisted only of interrupted sections here and there.

Travel during the period in which the transition was taking place was not a pleasant experience. Charles Dickens visited America in 1842, and described his journey in his "American Notes." From Halifax he journeyed to Boston by vessel, and from Boston went to Lowell by rail. He wondered that there were no first and second class carriages, and said: "The cars are like shabby omnibuses." The conductor wore no uniform.

Single Track.

"There is seldom more than one track of rails, except where a branch road joins the main line. The scenery is always the same—mile after mile of stunted trees.

The train dives through the woods, emerges into the light; suddenly it awakens all the echoes in the main street of a town, and dashes on haphazard, pell mell, neck or nothing, down the middle of the street—on, on tears the dragon of an engine with its train of cars screeching, hissing, yelling, panting, until at last the thirsty monster stops beneath a covered way to drink."

He returned at night by the same road, "watching the effects of the wood fire of the engine in the darkness, for we were traveling in a whirlwind of bright sparks, which showered about us like a storm of fiery snow."

TRAVEL IN 1850

REPRODUCED FROM AN OLD ENGRAVING OF THAT PERIOD.

EARLY TRAIN ON THE MOHAWK AND HUDSON, NOW NEW YORK CENTRAL, 1832

Slowness of Rail Roads.

"From Springfield to Hartford is a distance of twenty-five miles, but the roads were so bad that the journey occupied ten or twelve hours at that time of the year (February). " The Connecticut River was "open" and he continued the journey on a small boat "with about half a pony of power."

He kept the middle of the deck, "lest the boat should tip over." The machine worked between it and the keel, the whole thing forming a warm sandwich about three feet thick. From Hartford he went to New Haven by rail in three hours.

In Virginia he left the Potomac Creek to go on by stage coach. These coaches, in lieu of springs, were hung on bands of the strongest leather.

The Bridges.

The first half mile of the road was over bridges made of loose planks laid across two parallel poles, which tilted up as the wheels rolled over them. They forded a river, which "had a clayey bottom and was full of holes, so that half a horse was constantly disappearing, and couldn't be found for some time. This singular kind of coaching terminates at Fredericksburg, whence there is a Rail Way to Richmond.

By Canal.

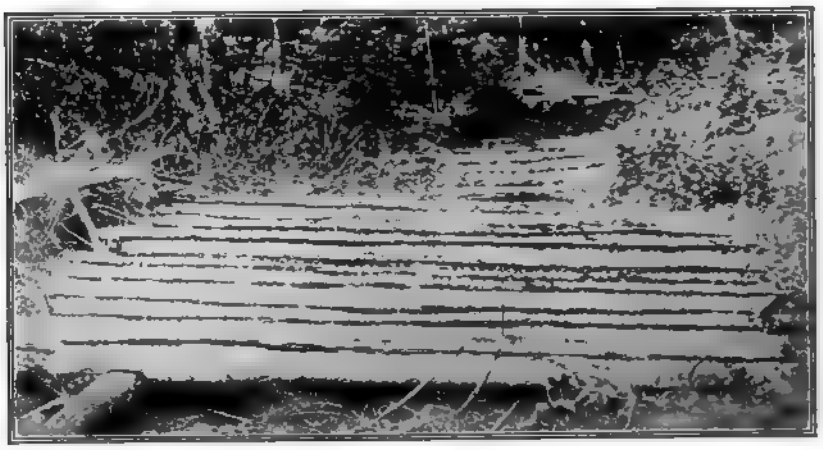
"From Harrisburg, by a canal boat of two miles per hour to the foot of the Allegheny mountains, where it stops, the passengers being carried across by Rail Road, over ten inclined planes, by means of stationary engines," another canal boat awaiting them beyond, for Pittsburgh. "Three days on board the Messenger to Cincinnati; from here to Louisville in the Pike steamboat, in thirteen hours "

In Columbus, Ohio, he hired "an extra," there being no stage coach that day, for Tiffin, whence there is a Rail Road to Sandusky

A great portion of the stage road was "corduroy road," made by throwing trunks of trees into a marsh, and leaving them to settle there.

By Stage Coach.

"At one time we were all flung together in the bottom of the coach, and at another we were crushing our heads against the roof. When one side was down deep in the mire, we were holding on to the other." Such were the conditions of travel in the "forties."



A CORDUROY ROAD.

Our New Geography.

Have we a new geography?

This question is perhaps directly answered by the statement of a few facts, which, though known to the reader, he may not fully realize and appreciate.

An Hour for a Day.

The time taken in traveling from Washington to New Orleans has been reduced from thirty days to thirty hours. From Massachusetts to North Carolina, instead of twenty days, the time required is barely twenty hours. Lewis and Clarke took a year and six months to travel from the Mississippi to the coast, a journey which now can be made in less than three days.

What formerly was done in a year can now be done in three hundred and sixty-three days less. We could pass San Francisco a dozen times in traveling constantly around the earth in the same eighteen months that were required by Lewis and Clarke to reach the Pacific Coast.

Annihilation of Distance.

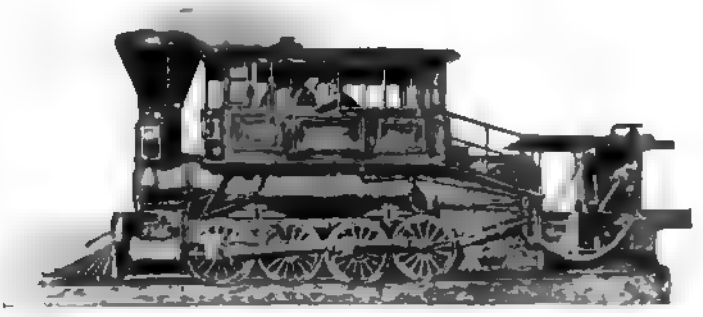
Practically any part of the United States is closer to Constantinople to-day in point of time than Boston was to Washington in the old days.

The Rail Roads have, as it were, made us a new physical geography, and leveled our mountains, so that man may surmount them with not as much individual muscular effort as that used by a bird.

Crossing Water. The Rail Roads span and carry us across canons and rivers, as though they were not there; they have wound around our hills and crossed our valleys. Mail, formerly delivered only by the courtesy of kind travelers at irregular intervals, whenever they made the trip, to-day is delivered every few hours. What this means may be better realized when we hear that even after the introduction of regular postal routes, but before the utilization of the Rail Road, delivery was only made once a week between the principal cities.

The Cheapness of Mail. The postal rates also have been reduced, from six to fifty cents per quarter ounce for distances of from thirty to five hundred miles, to the uniform rate of two cents for a letter weighing an ounce, to anywhere in the Union, or even Alaska, the Philippines, Samoa or Porto Rico. At the old rates, ounce letters for distances up to only 2,000 miles would average from twenty-four cents to four dollars each.

Thus do we find that we do have a new geography. The Steam Roads have, therefore, brought about the subjugation of man's persistent enemy, Father Time, and have, as it were, nullified or eliminated distances. They have succeeded in knocking the shackles, the ball and chain of laggard, tedious and costly communication, from the feet of mankind.



"Camel-back" Engine, 1851.

The Effects of Improved Transportation.

Widening and Joining. The improvement in and the cheapening of transportation have resulted in a broader field and higher wages for labor and increased consumption, resulting in the necessity for enlarged production. They have provided large numbers of people with an infinite variety of comforts and luxuries. Through mechanical transportation these wants have been supplied with a decreasing cost and absorption of energy and earnings of the consumer and producer. Briefly, it has brought about the marvelous expansion, development and growth of the nation.

This saving force has left time for the improvement of understanding, enabling man to enjoy a broader development of brain, thus gaining greater pleasures in life, for the work day need no longer be from dawn to darkness.

Better Living.

When one visits the Tower of London, with its slit-like windows, its unplastered stone walls and its stone staircases, it will be found not as well finished as and less comfortable than a first-class modern stable or cow-barn. Yet it was a royal residence and palace but a few generations ago, in and even later than the days of Henry VIII. The modern laborer lives in more attractive and congenial surroundings and with greater physical comfort than did the sovereigns of a few centuries past.

Concentrators of Labor.

The cost of both travel and shipping have been reduced from dollars to dimes, and in some cases to pennies.

The same facilities which have brought about these results, have aided emigration from the older states to newer and richer lands in other sections, immigration from foreign countries, enlarged and multiplied opportunities that have been eagerly grasped by millions, and have concentrated labor where needed to produce and fabricate. After the various materials have been wrought into products of finished form, the Railed Roads again have been agencies of distribution over the widest possible area at a minimum cost.

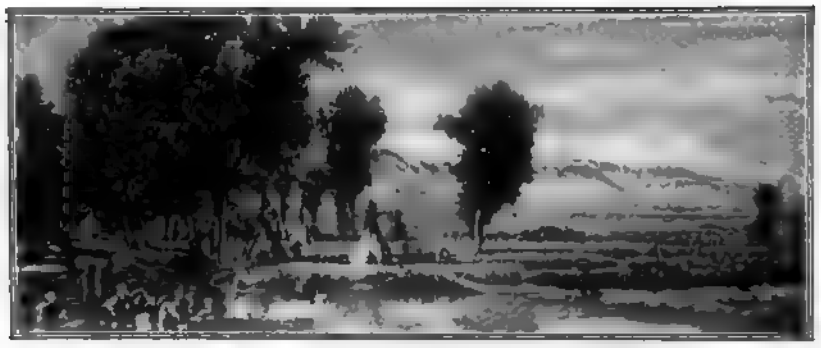
Were the same freight charges that were paid a hundred years ago levied to-day, the Rail Roads of the country would get more money for carrying our present volume of mail alone than the total of their present receipts for carrying passengers, freight, mail and express.

Luxuries for Every One.

The expensive articles of luxury which constituted the bulk of ancient commerce, that were only for the wealthy and nobility, though to-day enjoyed by almost every one, have had added to them the crude, raw and unhewn materials from widely separated localities, which are assembled and carried to serve man's best uses.

Savings and Gains.

What do these savings and added gains mean to our nation? Would it be possible for us to conduct the tenth part of our present volume of business by old methods and without the modern steam horse and road of rails?



APPROACHING THE ROCKY MOUNTAINS IN EARLY DAYS.

SECTION VII.

THE STEAM ROADS—THE REAL WINNERS OF THE WEST.

The Winning of the West.

Fifty Years Ago. A little more than fifty years ago the region west of the Missouri river was uninhabited save by Indians, many of them nomads following the buffalo for food, north in summer and south in winter.

Between the Platte and Humboldt rivers a white man was rarely seen. West of the Des Moines river, Iowa was at that time unsettled. Kansas, Nebraska and the interior states west of them were practically not upon the map, and were credited with no population in the census reports.

Under such conditions there were neither states nor law. In fact, the land was supposed to be worthless and impossible of habitation by white men.

Pushing Westward. The first private exploration to determine suitable Pacific Rail Way routes began in 1853. This exploration for a transcontinental Rail Road was made under the auspices of the Secretary of War, Jefferson Davis, who eight years later became president of the Confederacy

The outcome of this exploration was the organization of the Union Pacific Company, at Chicago, Ill., in 1862.

Lincoln.

It is a strange coincidence that the next practical effort for a Pacific Rail Road was by Abraham Lincoln, who, appreciating the necessity for transcontinental communication by means of a Pacific Rail Road, in 1863 sent for General Grenville M. Dodge, and instructed him to undertake definite surveys for a Pacific Rail Road. The threatened disruption of the country and our civil war were not the least of the causes which accentuated the necessity of tying the nation together with bands of steel.

The Pacific Rail Roads constituted the last section of the Rail Road system to the western ocean.

Cementing a Continent.

The Rail Road line west of Ogden, Utah, was called the Central Pacific, and the line east of Ogden the Union Pacific. Work was begun at both ends of the route in December, 1863; a suitable pass through the Black Hills was discovered in 1866. In May, 1869, the two roads met at Promontory Point, 56 miles west of Ogden, completing the first band which connected the East and the West.

GENERAL GRENVILLE M DODGE

THE LINKING OF EAST AND WEST AT PROMONTORY POINT, 1869.

The general direction of this line is almost exactly east and west, upon the 41st parallel, that of New York, Chicago, Salt Lake City and San Francisco.

Most of the road was constructed through a territory in which engineering difficulties of great magnitude had to be overcome. Yet from May, 1866, forward, more than a mile for every working day was completed.

The Hardy Rail Way Pioneers.

"The Union Pacific and Central Pacific were fortunate in selecting young men for their great task, not a few of whom were hardened by five years' service in the civil war."

All their soul and interest were in their work. Beginning in the exploring and engineering parties, many of these soldiers of progress rose to positions of prominence

When we contemplate the results of the achievement of the men who made this line, we realize that the real winners and makers of the West were the Rail Road builders, the men who created the

GENERALS KAUTZ, SHERIDAN, DENT GIBBON, GRANT, DODGE, SHERMAN, HARNEY, DR. DURANT, SLEMMER, POTTER, HUNT
GENERAL GRANT AND PARTY VISITING GENERAL DODGE AT FORT SANDERS, WYO., DURING THE CONSTRUCTION OF THE PACIFIC RAILROADS, 1868. AN HISTORIC PICTURE OF RARE INTEREST

machinery bringing this part of the nation into physical contact with the rest of the nation, making it, for the first time, commercially a part of it.

"Scarcely a mile of the Pacific Rail Roads—scarcely a mile of any line—was built without creating its story of courage, adventure and endurance. The history of the armed conquest of our national expanse is scarce fuller of romance than is that of its industrial conquest in the building of the Rail Roads. As we see later, even this was a conquest, if not by arms, at least under arms."

Grenville M. Dodge.

No man is better qualified to speak on this subject than General Grenville M. Dodge, the living Nestor of the American road builders, a man of almost eighty, the friend and confidant of Grant, and the representative of Lincoln in the practical initiation of this great enterprise.

As engineer, he has laid out, surveyed and built more miles and lines of Rail Roads than probably any other American, living or dead.

In substance, General Dodge says that when he first saw the country west of the Missouri river, it was supposed to be without natural resources or productivity, a vast expanse of arid plain, broken here and there by barren, snow-capped mountains.

The Past.

It cost the government from one to two cents per pound, forty dollars per ton, to haul freight one hundred miles in that region of the country. The expense of a military escort had to be added, without which nothing could be moved in this territory with safety.

The Present.

To-day this region is traversed by five great transcontinental lines, and some classes of freight are carried from San Francisco to Europe, 7,000 miles, for less than one cent a pound, or seventeen dollars a ton.

Its plains teem with all products. It has become perhaps the greatest granary in the world. It produces millions in precious ores, and from mountain range, plain and valley, iron, coal and oil are taken in great quantities.

Pacific Rail Road Surveys. In 1863-4 surveys of the country, extending from the Missouri river to the California state line, were begun, covering a width of 200 miles, along the 42d parallel. Fifteen thousand miles of instrumental lines were run, and 25,000 miles of reconnaissances were made.

In 1866 the country was systematically occupied for the purpose of surveys. Day and night, summer and winter, the explorations were pushed forward through dangers and hardships that very few at this day can appreciate.

Under Guard. Every line had to be run within range of the muskets of guarding soldiers; there was not a moment's security. "We marched to work at the tap of the drum, with our men armed." They stacked their arms on new piles of earth, and were ready at a moment's warning to fall in and fight for the territory they were sent to win.

EXPLORING PARTY FOR THE UNION PACIFIC

Numbers of men, some of them the ablest and most promising, were killed. Live stock was stolen by the hundreds.

For 500 miles in advance the country was devoid of timber, fuel, or any material with which to build a Rail Road. Everything had to be transported by teams, or in part by steamboats, over hundreds of miles.

Central Pacific Route. Building the line of the Central Pacific from San Francisco to Ogden was induced almost entirely by development of the mining industries in California and Nevada.

After the road was completed, in many cases, it had to be changed to escape a great danger which no one had reckoned with — the snow. It was learned that every summit, every mountainside, every valley had to be studied to find which was the snowy side and which the barren.

The Help Extended. The Union Pacific received the equivalent of $16,000 per mile, from the Missouri river, for 650 miles; then $48,000 for 150 miles; then $32,000 per mile to Promontory from the government.

The nation is adding each day to its treasure more than the yearly interest upon all the sums it expended, and does not yet know the full value of the sources of wealth it acquired.

AN EARLY FERRY ACROSS THE MISSOURI RIVER.

Climatic Changes.

The Pacific roads have changed the climate, especially between the Missouri river and the Sierra Nevada range.

Before Settlement. Before it was settled, much of the region west of the Missouri river could raise but a small part of the staple crops, except by irrigation. For six months, from April until September, as a rule, no rain fell. The melting snows of the mountains in the late spring and early summer furnished the streams with water; and from these and the "underflow" the bunch grass drew moisture to sustain it until July. Then it became dry and brown; the drouth and heat cured it upon the ground, and it furnished a scanty supply of standing hay.

The bunch and buffalo grass sustained animals on the plain in winter. Except this, the twigs of the cottonwood trees, frequently found growing near water courses, furnished the only sustenance.

Desolation. Vast tracts of shrubby sage brush and tumbleweed wearied the eye with their ragged, endless monotony. High winds stripped the surface of soil, and terrific dust storms drove clouds of dust about.

On the hot, light-colored earth and the sand, the sun beat relentlessly, and its light, reflected back upon the traveler, strained or almost blinded his eyes and those of his horse.

Buffalo Food in Winter. The buffalo, in hundreds of thousands, migrated from region to region, grazing on little but bunch grass, even in winter.

The ability of the buffalo to thrive on the plains suggested the introduction of our great western cattle industry and

the stocking of immense ranches. These gradually changed the character of the vegetation.

The tall, harsh "blue-stem" and the wiry brown bunch grass disappeared, displaced by finer growths or by domestic grasses.

Forest growth increased also, and the plains that once were as bare of brush or brake as asphalted Broadway, now sustain numerous plantations of trees.

Climate Becomes Gentler.

Rainfall has increased to such an extent that now a wet season is frequently as much a matter of apprehension to the farmer as were the drouths and "hot winds" of Kansas in earlier days. In eastern Kansas, for instance, one frequently finds dikes and dams along the streams to protect crops from overflow from too heavy local rainfall.

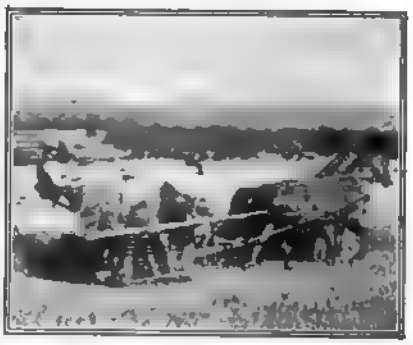
The rain belt has reached even the plains of Colorado, and the farmers of that high, dry state have raised crops without irrigation close to the foot of the moisture-robbing mountains.

Thriving Cities.

Already there have been built up great commercial centers, each controlling a territory approximately 500 miles in diameter—one on the Missouri river, one in Colorado, one in the Salt Lake Basin, four on the Pacific Coast, and others in the Idaho Basin, on the Rio Grande, in Montana, Oregon, and New Mexico.

The trade developed in that empire in little more than thirty-five years, scarcely the age of a man in his prime, passes almost beyond all belief.

AN OLD-TIME REAPER



AN EARLY REAPER WITH STAND FOR BINDERS

THE WINNING OF THE NORTHWEST.

One Settler in a Great State.

In the early seventies, along the present path of the Northern Pacific Rail Road, there was but a single white settler—a woman—between the Red River of the North and the Missouri

Until 1880 Grand Forks was the limit of even the government survey, and there was not a house in Northern Dakota throughout

A Red River trading boat at St Paul, 1859

Early St. Paul Railway time table.

the rich and splendid territory now tributary to the Great Northern Rail Road.

Rescued from the Wilderness. In the vernacular of the time, that country was "fit only for Indians and the devil."

The Rail Roads have rescued these barren plains and uplands from the wilderness, as commercial derelicts from a sea of uselessness and converted them into great mediums for progress and prosperity.

The once-feared, Russian-like winters of the Northwest have been found to bring zest and health, and because of the changes wrought by science, irrigation and dry farming, the word "uninhabitable" does not apply any longer, for to-day part of what was then the great American desert has been turned into a "compartment of the bread basket of the world."

Where there was not a tree or bush in sight, and little that might be identified as vegetation, there are now waving wheat fields, feeding the hungry in many parts of the civilized world.

The Struggle. This conquest of nature, like all other conquests, was not without its heroes and not without its cost, the difficulties encountered being similar to those met with in the building of the Union Pacific.

Five years of struggle were consumed in building the pioneer ten miles of track in the borders of this region, between St. Anthony's Falls and St. Paul.

Ten years more, "after deep dipping into Dutch pockets," enabled a Rail Road with the high-sounding name of "The St. Paul and Pacific" to crawl for some 400 miles up the Mississippi and across the state of Minnesota to the Red River.

Bankruptcy. Despite state aid, grant, regrant, and nine successive mortgages, this enterprise became so hopelessly bankrupt that not enough seemed left to warrant even reorganization, and to allow a decent financial funeral. The total receipts hardly equalled the cost of running the trains, to say nothing of providing interest for capital and keeping the rolling stock and road in workable condition.

The Man of the Hour.

At the time when everything seemed darkest for the St. Paul and Pacific, there appeared upon the scene James Jerome Hill, a man apparently gifted with second sight, with an iron will, determination and energy, and the only one with courage and nerve enough to attempt to pluck this dismal failure out of its commercial slough of despond.

For two years capitalists whom he endeavored to interest merely laughed at his proposition; but finally he won over Commodore Kitson, Donald Smith (now Lord Strathcona), then Chief Commissioner of the Hudson's Bay Company, and Sir George Stephen.

He bought the bonds representing the guilders of the Dutch, which the owners were glad to sell for from 15 to 80 per cent of

A MODERN AND THE FIRST LOCOMOTIVE (1870) ON THE GREAT NORTHERN RAILWAY.

their par value. In the foreclosure which the necessity to start with "clear decks," made necessary, the stock and $10,000,000 of bonds and money were thrown overboard and wiped out of existence; no one envied the new owners their bargain.

Two Streaks of Rust.

Such equipment as there was, Rail Way progress had already made primitive. Two rusty tracks, as all St. Paul said, were the only reminders of the original fifty-pound rails. It was said that "only an Indian's eye could tell where the Rail Way ran, by the line of prairie sunflowers that had sprung up along the 420 miles of track."

There was not a night operator, nor a Sunday train, and the only freightage was wheat which matured but once a year.

It took courage that has seldom been equalled, which at that time appeared foolhardy, to undertake the extension of such a

wreck for 1,000 miles farther, with the small mining town of Helena the only inhabited place on the line.

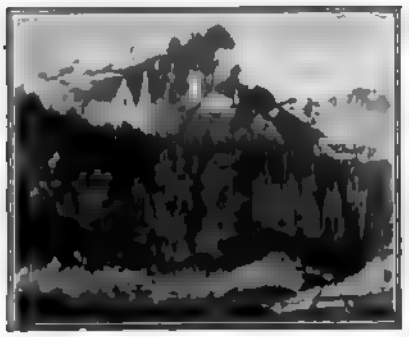
Mountains the Barriers.

Worst of all, beyond Helena, some of the most difficult mountains of the continent had to be crossed, the Belt, the Crow Creek, the Rockies, the Bitter Root, the Cascades and the Sierras. The sages of the time said that Hill would get his road up into the Rockies, but never down again.

The last rail was laid one day in January in 1893, and "an engine's whistle reverberated through the canon of Skykomish." This marked the completion of a transcontinental Rail Road built without the grant of a dollar of public money or an acre of public land.

Peopling.

The builders not only had to conquer nature, but they had to people the great territory which was open for the march of progress and the entry of prosperity. Long before the Rail Road was finished agents had



Mt. Index, Washington and Great Northern Railway.

Martin Creek trestle and tunnel.

been sent to New England and New York, to Great Britain, Germany, Norway and Sweden in search of practical farmers.

Earliest Reclamation.

Though no populous cities rose on the plains, the whole of Northern Dakota, gridironed with branches of the Great Northern, was reclaimed from the wilderness and plotted out in rich farms. The waste places were being made glad.

The Northern Pacific.

To the south of the Great Northern lay the parallel line of the Northern Pacific, which, like the old St. Paul and Pacific, was in a chronic state of bankruptcy, until, after a long and hard struggle, it finally gained a measure of success.

The Region Served.

The Northern Pacific was begun in 1870 It pierced a territory that was at least ten times as large as the state of Pennsylvania, yet did not have a mile of Rail Road, and only a few miles of common roads, which were of the primitive kind. Nor was it then equal to the support of a Steam Road

More than once the road appeared doomed to disaster. With the final triumph of endurance, however, the Northern Pacific began the development of our great Northwest, a region of inestimable commercial and industrial possibilities, many of which have today been realized.

Villard. After this road had ruined Jay Cooke, the financial savior of the credit of the nation, the burden was taken up by Henry Villard. The latter securing additional money at home and abroad, which was poured into what seemed a financial pit-hole, wrought success out of failure, and changed a great part of the United States from a scene of stagnation to a field of progress and prosperity, activity and wealth. And then it failed again, in 1893, carrying Villard down with it. It was again reorganized in 1896.

Thus two men who had practically created this important section of the United States were ruined for their pains, although since then the territory they opened has become a great producing area and tremendously rich.

Foresight Rewarded. The judgment and enterprise of Hill, Jay Cooke, and Villard have been paid the great compliment of imitation by the construction of a third parallel line, the Chicago, Milwaukee & Puget Sound, across this northern region. There are also three lines to the north in Canada. The Canadian Pacific is already built; the Grand Trunk Pacific, and Canadian Northern are under construction. To the south the Western Pacific is at length in operation; farther south still the San Pedro is also a link to the Pacific. Still farther south, the Kansas City, Mexico & Orient is reaching for the tidewaters of the Pacific at Topolobampo, Mexico, on the Gulf of California.

The treeless districts of the corn belt, Iowa, Kansas, and Nebraska, are receiving material and timber from the forests verging on the Pacific, and even the Atlantic states are drawing a part of

MINNEAPOLIS, 1857, BEFORE THE RAILWAYS ARRIVED.

HILL'S WAREHOUSE, ST. PAUL, 1868.

their house-building material, fruit, and many other things from the same source.

James J. Hill.

The builder of empires and practical economist has fulfilled his promise "to make wheat flour as cheap as rice for the millions of the Orient," that our farmers might profit by the new demand.

He showed the Chinese and Japanese how bread should be baked, scattering literature in many vernaculars throughout the Far East.

The first American cotton ever shipped to Japan and the first order from that nation for American steel rails went by this route. In a single year the export of raw cotton from Puget Sound to Japan amounted to 160,000,000 pounds, and within a twelvemonth over 2,000,000 barrels—400,000,000 pounds—of flour went from Portland to the Orient.

From Sledge to Rail Road Car.

The traffic of the old Northwest has been taken from sledges and steamer, mule back and Red River cart, and stowed in 20 and 40-ton cars. The dream of John Jacob Astor has come true, and the vision of Columbus has been realized, in the sending of the commerce of the world from the Occident westward to the Orient.

THE WINNING OF THE SOUTHWEST.

The story of the progress and prosperity and the building of our Southwestern states, which followed the construction of the Texas Pacific and the Southern Pacific, is also a commercial romance of great interest.

A Romance of Commerce.

In the days when these were built much of the territory, particularly that west of Fort Worth, was a scantily Indian-trod desert. Fort Worth was then a typical frontier town, where every man carried his own artillery, and where the rattle of the faro chip and the

crack of the revolver in daily or nightly broil were familiar sounds, occasioning only passing comment.

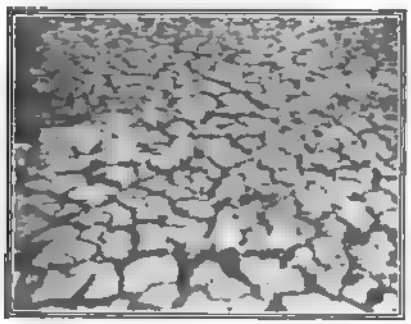
Fort Worth was run "wide open" in those days, and a famous aphorism is said to have originated about this period in this place: "All whiskey is good—but some a little better."

The Men Who Dared.

A friend of the writer's, one of the engineers who laid out this route, has fascinated him for hours by tales of the hardships and dangers experienced in looking for a practical route across this part of the great American desert; they had to go heavily armed, usually with a military escort, and nearly always subject to attack by hostile Indians; some of their men became separated from the main parties, and blistering under the copper skies, died from thirst or famine, for it was sometimes a hundred miles or more between water holes.

Tohu Va Bohu.

Some of this region is scarcely less forbidding to-day, after one leaves Abilene, Texas, by rail. There is little of interest to break the monotony of the landscape, except chapparal, cactus and prairie-dog villages. And the prospect continues to grow worse and worse for hundreds of miles, as one goes farther West.



SUN-CRACKED SOIL OF THE DESERT

AN INDIAN POLE DRAG

The land becomes too baked and parched for chapparal, and finally even the cactus disappears. "The Abomination of Desolation," would be a complimentary description, for the red and brown mountains, surfaced with broken rocks, are absolutely devoid of soil or vegetation.

The Daring of Heroes.

When one thinks of the courage of the Rail Road builders who had the temerity to bridge this red sea of rocks, sand and desolation, does it not seem that every milestone of this Rail Road might properly be considered a monument to the courage of the engineers and financial pioneers who opened up this territory?

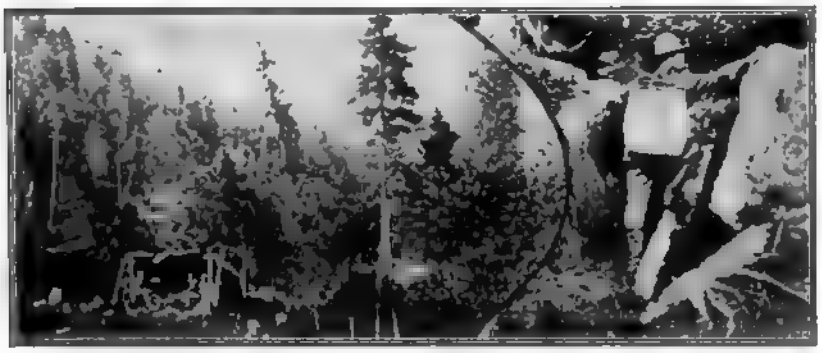
Here some of the greatest of our mineral resources are now yielding a stream of wealth; irrigation and dry farming are wresting from these arid deserts their contribution to the nation's wealth, for the Rail Roads have proved that in many place where the sage

brush and chapparal will flourish valuable crops properly selected will also grow. There are also vast herds of cattle, in increasing numbers, as the climate changes for the better through the advancing tide of agriculture.

Some of these lands, renting a few years ago for from one to five cents an acre as cattle ranches for grazing, are now held for sale at from $20 to $50 an acre.

A Peculiar Coincidence.

From 1872 to 1874 the surveys from Shreveport, La., to San Diego, Cal., were made. Building was commenced from Marshall Falls west, and from San Diego east in 1872 by the Texas and Southern Pacifics. The engineers, constructing force, and track-layers who met at Sierra Blanco, Tex., in 1883, to connect the two links that joined this work, were largely the same men who drove the golden spike at Promontory Point, Utah, May 9, 1869.



A MOUNTAIN LEAN-TO. PACKING UP A MOUNTAIN TRAIL.

The First North and South Road in the Southwest.

The Capitol Pasture.

In 1883, only 27 years ago, the first due north and south road west of the Mississippi was started, being built from Fort Worth. Then the inhabited section of the country extended only 100 miles north of Fort Worth. Beyond that, from Harold to Trinidad, was a country nearly 600 miles in length, that was practically uninhabited; 150 miles of the road ran through what was termed the Capitol Pasture, a tract of 3,000,000 acres of land given to capitalists in payment for the building of the state capitol of Texas, as Texas had much land and little money in those days.

The Fort Worth & Denver road ran diagonally across the Great Staked Plain, known in our early geographies as the Llano Estacado, which extended from the west line of Texas to the eastern line of the Pan Handle, and south to the border of Mexico.

As a general thing this region was devoid of running water, and obtained the name of the Llano Estacado, or Staked Plain, from the fact that when the Mexicans owned the country they found it necessary to stake out a road across it to mark their way.

Wilson's Faith.

In 1889 James Wilson, who in 1897 became Secretary of Agriculture, visited this region and predicted a future for it such as few believed possible. But it has already more than met his prediction, for it is becoming one of the safest for crop development of any portion of Texas.

The Power of Rail.

To-day there is a Rail Road extending from Galveston, Texas, along the eastern base of the Rocky Mountains, to Orin Junction, Wyoming. When a 250-mile link, already begun, is completed, it will give a line along the east base of the Rocky Mountains, from Galveston to Edmonton, Canada, which promises shortly to be extended to Hudson's Bay.

The length of this line, north and south, will be approximately 3,500 miles, or more than the distance east and west across the continent.

What Might Have Been.

The progress and development of this Southwestern country would have come about much earlier, and the population of Texas been much larger, but for the attitude of one of her officials at a critical moment.

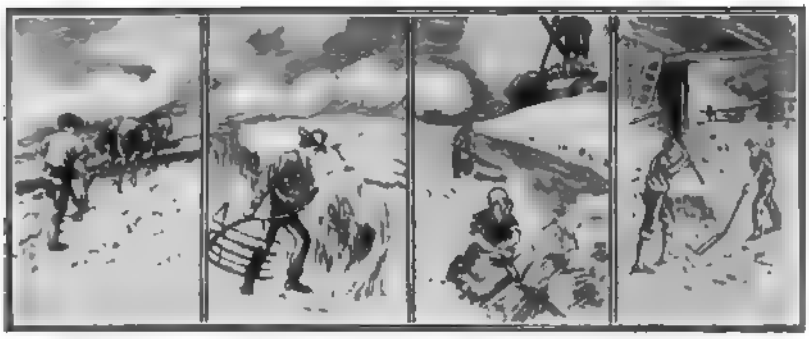
In 1883 the Southwestern Rail Roads assessed themselves $25 a mile, for the purpose of advertising that territory in Europe, to induce emigration.

Narrow Conservation.

Millions of pieces of literature were distributed, with such success that the tide of immigration was being turned in that direction. Then a governor of Texas, John Ireland, in his inaugural address, vigorously discouraged this immigation. Rail Roads in other sections of the country had his address printed and distributed for the purpose of stemming the flow of the tide, and with such authority to back them, succeeded without much difficulty.

The money spent by the Southwestern Rail Roads was practically wasted, the benefits which should have accrued to Texas being reaped by the Northwest.

TOWN, COURT HOUSE, OPERA HOUSE, MAYOR AND JUDGE, LANGTRY, TEXAS, S. P. RY.



FARMING IN 1835. PLOWING, REAPING, BINDING, THRESHING

Numerous Failures.

The Iron Mountain Rail Road and the Texas Pacific experienced disheartening vicissitudes, and went through foreclosure in 1887. Huntington, the pioneer of the Southwest, risked his fortune in the Southern Pacific, and there were times when he tottered on the brink of bankruptcy.

It is said that on one occasion some of the banks of New York called upon him to repay vast loans which he had made for the purpose of carrying out this, his favorite enterprise. When he told them that he could not repay the loans, they threatened to sell the securities held against them, and he is said to have replied:

"If you can sell them, you are able to do more than I can. Go ahead."

Although his efforts finally met with success, the Southern Pacific proper, built in 1885, has paid a profit to its stockholders only during the last few years.

A Word on the Early Rail Road Builders.

Men Courageous.

Who can justly say that the history of the Pacific Rail Roads and the winning of the West, which we have just recited, is not a history of human courage, faith, confidence, foresight, judgment, energy, tenacity, hardy adventure and endurance?

That famous and rather cynical statesman, John Sherman, called the first two Pacific Rail Roads "the work of giants."

Men believed that these roads would never make enough net profit to pay interest on their cost. In the East there was little confidence in the attempt. In the West the laborers upon the work demanded their day's pay in advance.

The Courage of Faith.

But a few men threw their fortune into these enterprises and supported them with their credit. They were called fools and fanatics at that time. Such united support as they received came largely from the army, which was their co-worker in constructing these roads and in building this new empire. "What makes me hang

on," said Oakes Ames, the real sustainer of the Union Pacific, referring to this support, "is the faith of you soldiers."

A great man said: "Many suppose that the men who built these roads ventured into them for mercenary motives alone. The truth is, that their hearts and their patriotism were in the work as much as were the hearts and patriotism of those who fought in our wars." The transcontinental lines certainly kept the Pacific Coast in the Union.

Americanism. It is but reasonable to suppose that if these men had invested their money and their efforts in other enterprises in that period of opportunity, they might have been equal gainers. Ames once wrote, during the struggle to finance the Union Pacific: "Go ahead; the work shall not stop, even if it takes the shovel shop (his factory). Save the credit of the road. If necessary, I will fail."

MODERN PLOWING WITH GASOLINE ENGINE, TURNING 15 FURROWS AT ONCE

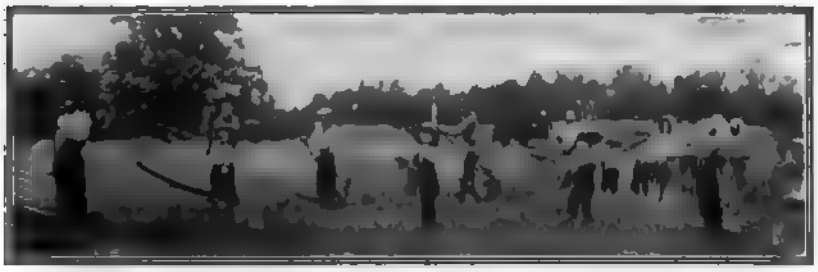
Failure came, and this blow, followed by others, brought him to his death. But the work that his heart was set upon did not fail.

The Courage of Sacrifice. Do not the hardships borne by these pioneers, the builders and engineers of the various roads, entitle them to classification among the great pioneers of the country? A large number, indeed, laid down their lives for the work. Many stations of the Union Pacific and Central Pacific bear the names of those who were killed in the construction of the roads.

Do not the men who made possible this great work, deserve to be remembered together with the soldiers of our martial history?

Four Great Empires. The four great empires lying between the Missouri and the Rockies, between the Rocky Mountains and the Wahsatch, between the Wahsatch and the Sierras, and between the Sierras and the Pacific, are the enduring monuments of the men who laid the foundations of the progress and prosperity of the region, making possible a population of 50,000,000 between the Missouri and the Pacific Coast within twenty years from to-day.

It is common, even to-day, to criticise these men, who were harassed, in some cases bankrupted and driven to their graves, but the work of the Ameses, Dillon, Duff, Durant, Atkins, Dexter, Baker, Dix, Brooks, Stanford, Huntington, Hopkins, Crocker, Cooke, Villard, Hill, and others, stands, and will show its results while the present order and system endure.



CUTTING GRAIN WITH THE CRADLE AS IN 1830

Who Were the Early Rail Road Builders?

A Wrong Idea.

The prominence given to a few families and men on account of their connection with Rail Road building and operation, has created a general impression that these were born of or connected with a peculiar transportation aristocracy.

Let us see from what stock they sprang. The first Vanderbilt was a ferryman; Huntington and Crocker were grocerymen in Sacramento and in a mining camp, respectively; Ames was a manufacturer of shovels; Daniel Drew was a cattle dealer; Stephens was a civil engineer; Cornelius K. Garrison navigated boats on the Hudson; Hill was a farmer boy, and later a steamboat hand; Dodge was an army officer; Gould began as a salesman; Sir Donald Smith (Lord Strathcona), was an employe of the Hudson Bay Company at $100 a year; Van Horn was a telegraph operator, and Harriman a minister's son.

Success Still Attainable.

Among our present Rail Road executives there are also many who have risen from the ranks, from brakemen, station agents, telegraphers and like positions.

These men were born of the aristocracy of energy, enterprise and accomplishment. They were men of force, physical and mental, such as may be found in any walk of life. The keynote of their success has been work, untiring energy, and a willingness and ability to concentrate, conceive and achieve along greater lines than their fellowmen. The same is true of union railway builders

Long Waits.

None of the first four great Pacific roads was profitable until many years after its construction. Three, at different periods, wrecked their builders, and the fourth brought its owner to the very verge of bankruptcy.

CUTTING GRAIN NOW, A MODERN HARVESTER AND THRESHER COMBINED.

De Soto, Vasco da Gama, the Cabots, Marquette or Pizarro never performed such practical service for, nor added such wealth in their time to their countries, as can be credited to the work of the almost unknown pioneer Rail Road builders in behalf of the United States.

So Great, and Yet So Small.

The countries whose discoverers and explorers brought under their dominion parts of the world, were made rich, it is true, but only temporarily, while the Rail Way explorers and builders of the United States brought under the domain of the government an empire which is a steady, permanent source of greater wealth than any territory ever acquired by conquest or discovery for one of the nations of Europe. It may be worth our while to heed the mediums by which it was given practical value.

No other factor has been so important as modern means of transportation in making America as wealthy as it is to-day. Uncultivated land and riches lying beneath the ground are of no commercial value and cannot be called wealth until they fulfill their purpose of satisfying some want.

Foundation of Industry.

Rail Roading is the virile business of our day and generation, on which nearly all other enterprises and interests must rest, and through which they are given broader movement, activity, energy and life.

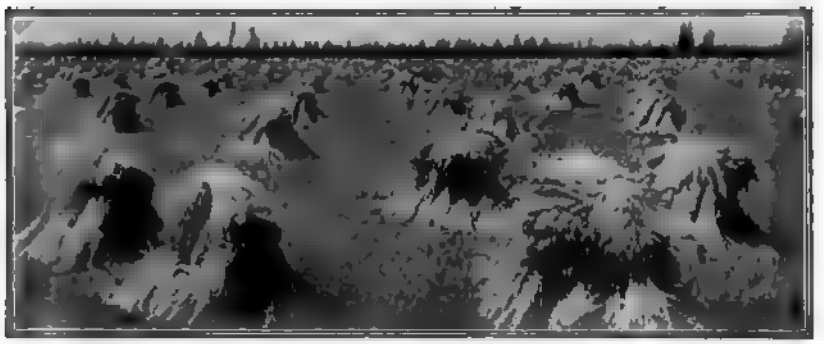
The history of the world has never had more quickly set upon its vast stage so wonderful a transformation scene or a more remarkable example of what transportation can do, than the growth of this region.

Appreciation.

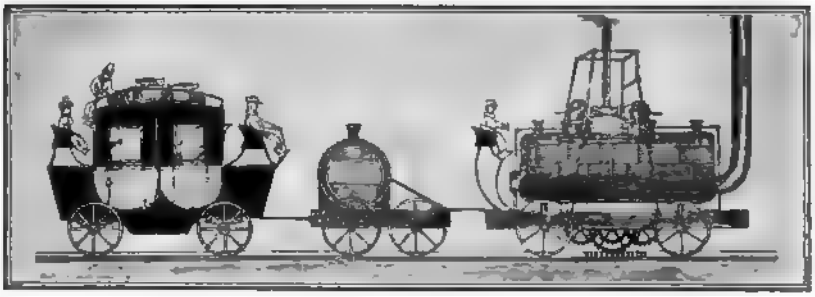
The transportation business must be recognized as our most vital industry; the Railed Road as a road and highway of communication should be properly appreciated. When calm judgment looks in retrospect upon the work that America's great transportation creators have done, and the inestimable value of the roads they have created and the iron

horses they have put at the service of mankind is realized; when it is acknowledged that these means have interlocked the two extremes of the nation and welded their people into a homogenous whole; when it is recognized how they have stimulated energy, increased intercourse, created trade, progress and prosperity, then will they be given proper place in our affairs.

Our nation will be better off when men work together for the further expansion and the completion of these roads and highways, which in many sections have been but begun.



A WHEAT FIELD NEAR SPOKANE



A CAR AND BLENKINSOP'S RACK ENGINE, 1812.

SECTION VIII.

THE BIRTH OF A RAIL ROAD.

INCORPORATION AND ORGANIZATION.

We have traced elsewhere the development of Rail Roads and shown something of the progress and prosperity of the nation which followed in their expanding wake.

We will now see how this active, motive force in the onward march of the nation is born and raised.

Incorporation. The first step preliminary to the bringing into existence of a Rail Road is obtaining its charter. Its corporate existence up to 1850, and in some cases still later, was the result of the grant of a charter by a special act of a legislature, and in the case of the Union Pacific and one or two other roads of national importance, by special charters from the federal government.

Securing the Charter. To day the granting of a Rail Road charter in most states is very simple, it being only necessary for the incorporators to give a name to and to specify the objects of the company in the application filed, and to pay the fees. Thereupon the state grants permission to organize and operate a Rail Road in accordance with the provisions and special acts providing for such companies. In certain states, the Rail Road commissioners have recently been given the power to limit the amount of stock and bonds to be issued on the properties, and in some cases to require a certain amount of money to be paid in, or even judge of the desirability of the new road at all.

Legislation. In Rail Road legislation, New York set the example in 1850 by the enactment of a general or statutory Rail Road law. This law brought about uniformity in charters, and prevented favors from being granted in special charters. While charters in different states may vary considerably in detail, they are largely the same as a whole. In many states, if the Rail Road company fails to begin operations within a certain time, the charter terminates by limitation. In some states, the running of one or more trains per day is obligatory to keep the charter alive.

Maximum Rates. In several states there are constitutional provisions providing that the state may assume to name a maximum rate for transportation. Massachusetts alone provides in its charters for the right to purchase the Rail Roads, but this right has never been exercised.

The preamble to the average modern Rail Road charter refers to the act of the legislature under which it is formed. In speaking of a Rail Road in its legal and corporate sense, we always say:

"Chartered under the laws of the State of ——."

A Rail Road, therefore, is a recognized entity in the community, and while an artificial, nevertheless a lawful citizen, created for purposes of commercial convenience and for public benefit.

A Legitimate Business. Consequently, it would seem entitled to the legal and constitutional rights of the citizens—to freedom, equality, and protection, in common with any other property, citizen, or business.

Many businesses and occupations in the United States have become legal entities only by custom. The rights of the Steam Roads seem much more strongly and distinctly defined. Their creation and operation have been carefully considered and especially provided for by law.

Election of Officers. After such a road is incorporated, the stockholders in the enterprise elect the directors, and they, in turn, the officers of the company, so that it becomes a working commercial body.

PRELIMINARIES.

Reconnaissance, Surveys and Location.

Following the legal details just recounted, the officers and probably their engineers, travel over the country through which the Rail Road is to pass, to give it preliminary examination, both physically and commercially. This may have been done by the parties originating the enterprise before incorporation.

Reconnaissances. They consider the general location, as shown by maps, drawings, etc. They look up the country with a view to finding if it be mountainous, or even seriously rolling, what may be the climate, its agricultural, mining, timber and industrial resources, etc.

It is necessary to size up the connections with other roads, for the Steam Road has not only to obtain freight and passengers, but in the great majority of cases, must enable these things and people to reach broader fields and markets than are covered by itself. A good Rail Road should also have "feeders" from outside its own territory, from which to receive goods for distribution within its own limits.

Looking Ere Leaping.

The same preliminary investigation is made by an established road when contemplating an extension into new territory. The proposed extension is then gone over by representatives of the commercial or general manager's department, by the operating department, by the treasury or finance department, by the chief engineer of the road, usually by the president or some of the vice-presidents, and sometimes by the directors.

The enterprise has to prove itself sound and attractive from these many standpoints, before it is entered upon. As a result, mileage built by an existing road is usually more successful than that of a new line

Hardships of an exploring party for the Union Pacific

Building for To-morrow.

Sometimes extensions are built, which it is realized will not be immediately profitable, but which are expected to develop into remunerative enterprises later, because they may form useful connections, or develop rich lands or productive territory.

The venture in this case may be compared with the farmer who plants an orchard, knowing that he will have to wait and carry it for a number of years before it will bear fruit.

Preliminary Surveys.

Then follow the preliminary surveys. Usually quite a number of lines are run to determine which is the most economical, shortest or best between terminal points. The shortest line is not always the best, the important factors of curvatures, grades, cost of construction, including that of bringing material for building, the reaching of places that will produce traffic, and, above all, the cost

of operation having to be carefully considered and weighed, one against the other. A large sum is usually spent on surveys.

Later, the most desirable of the preliminary lines surveyed is selected, and becomes, in Rail Road parlance, "the location," gradually refined into the "permanent location." Details of the cost of this phase of the work are found in "The Analysis of a Rail Road."

Right of Way. Next in order comes providing the right of way. The line along which the road is to be built consists necessarily of a continuous strip of land, the length of the entire road, varying from sixty to two hundred feet in width, with additional land for stations and terminals. Detailed information about right of way and its cost is found in an article on the subject.

Stocks and Bonds and the Reason for Them.

After the charter has been secured, the company organized and the surveys made, financing to enable construction and operation is the vital and essential step.

Mortgages. Practically all charters provide for the right of the Rail Road to mortgage its property, thus enabling it to raise funds. The mortgage is usually divided into units of a thousand dollars, covering the entire property of all

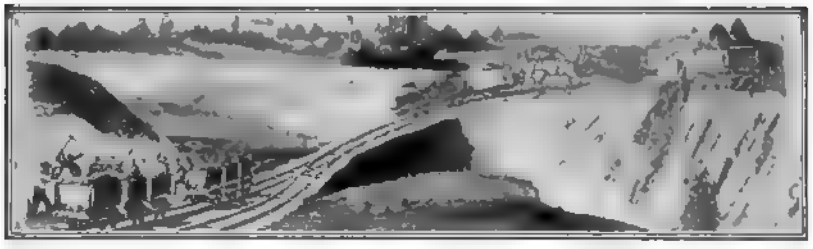
ON A RECONNAISSANCE.

and every kind. Sometimes these units are reduced to five hundred, and occasionally, even to one hundred dollars, and are commonly known as bonds. Some evidence of the interest represented by money or work put into the enterprise had to be found, and stocks and bonds proved to be the most convenient means of filling this necessity.

What Is Needed. Some one once asked a Rail Road builder what is necessary in order to build a Rail Road, whereupon he replied:

"Money, and then some more money."

When it is realized that it has cost over $5,000,000 to build the average 100 miles of main track, including its percentage of nearly 50 miles of second and side tracks, with all the necessary appurtenances, rolling stock and equipment, it is seen that he was not far from wrong.



EARLY PORTABLE RAILROAD USED IN RAILWAY CONSTRUCTION.

Raising Money. A few companies possessed sufficient credit or were attractive enough to enable them to sell their stock to raise the money for building. But from the beginning of Rail Road construction this money had to be obtained from the public. The investor wanted an underhold, and mortgages were filed, or bonds issued, on the roads. In the case of the first transcontinental Rail Road, the government grant of lands furnished a basis for the mortgage.

The stock value depends upon the earning and management of the road. The fact that there are bonds or underlying securities, puts a premium on the economic and energetic operation of the property, the penalty of failure to pay its interest charges being forfeiture of the road, loss of dividends, depreciation of stock, and scaling down of the principal of the stockholder.

Insuring Against Loss. Very few people would loan a farmer money except upon a mortgage, unless they know the borrower and are assured of the excellence of his credit. Further, while the person putting money into a property may have confidence in the people then controlling it, there is no assurance that their successors will do equally well with the property. If the owner fails to pay interest on the mortgage, the mortgagee can foreclose and thus secure the return of his investment, so far as the corpus of the property itself will repay it.

What Is a Bond? A loan on Rail Road property is evidenced by a mortgage, similar in effect to a mortgage on real estate, save that it is a chattel mortgage as well, covering all property, fixed and movable. This document binds the borrower to repay the loan on maturity, and to pay interest at specified periods.

The Loan's Distribution. As the ownership of a Rail Road is divided among many people, and attested by stock certificates, so usually are its borrowings divided among many, whose fractional participation or interest in the total bond issue is evidenced by a certificate, called a bond.

The interest to be paid is represented by coupons attached to the bonds, which are practically checks or promises to pay on a trust company or the trustee for the bondholder, dated ahead, each for the amount of the interest payment for the six months preced-

ing its date. But these checks are not good or paid unless there are earnings deposited from time to time to pay them as they become due.

Various Classes of Bonds. The exigencies and requirements of a Rail Road are not always covered by the first issue of bonds, and it is sometimes necessary to issue additional bonds, called general lien, divisional, consolidated, income, first consolidated, second mortgage, etc., which are perhaps sufficiently described by their names.

Some Rail Roads, when in need of money, have issued income bonds, the interest upon which is paid after that on the regular bonds, but before dividends can be declared on the stock. This is little more, however, than a preferred, or perhaps a preferred preferred stock.

Extensions. Most of the Rail Road bonds now issued are guaranteed by powerful companies with established earnings, to build branch or subsidiary lines. Such bond issues, therefore, come under a very different heading from their predecessors, which had behind them no guarantee or established income.

The same difference exists as between the paper endorsed by a large property holder and that of a borrower with little or no property and doubtful credit just establishing a new business, or between single and double name paper.

Collateral Notes. During the recent panic, the period of high money rates and consequent slack demand for low interest paying investment securities, our Rail Roads had to issue collateral notes to tide them over until money rates would enable them to dispose of their long-term, low-rate securities.

The security for these notes consisted of the last or only unencumbered thing belonging to the borrower, its securities in other companies, which the borrower pledged by depositing them with a trustee.

TWELVE-MONTHS' SCRIPT ISSUED TO AID IN BUILDING P. & R. Ry

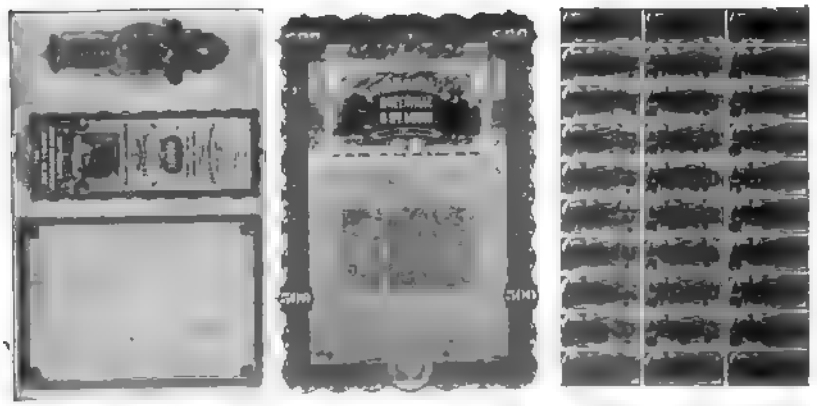
Discounts. Where a Rail Road lacks credit of the highest order, its bonds naturally sell at a discount, much as would the notes of an individual not well off financially or with doubtful resources. Interest, nevertheless, has to be paid on the face value of the security, and face value has to be returned at maturity.

Bonds run usually for periods of 30, 40 or 50, and occasionally for 100 years. The longer the term of the bond and the more thoroughly established the Rail Road, the lower is the interest rate.

Costly Cash. Our early Rail Roads paid high rates of interest, because the country at that time being very new, money was scarce and dear, as in the newer states to-day, which are undergoing the transformation from bud to blossom.

Even to-day the legal rate of interest in five states is 8 per cent, and in nine states 7 per cent, while the legal contract rate is as high as 12 per cent in seven states, and eight states allow an unlimited rate of interest on contract.

Higher Cost. The interest rate on Rail Road loans jumped up an average of three-fourths of one per cent during the panic of 1907, which means that on a 50-year, $1,000 bond, $375 would eventually have to be paid back in additional aggregate interest charges.



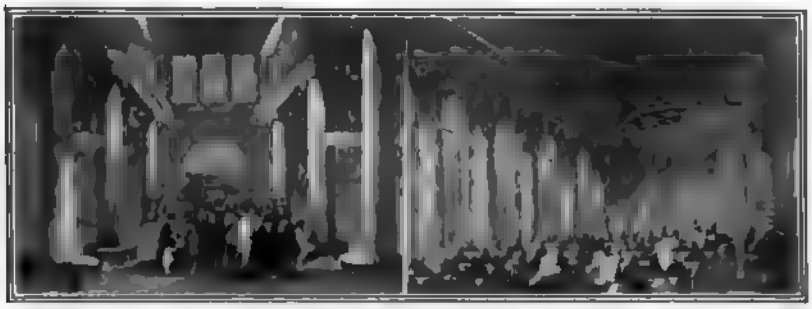
A RAILWAY BOND—WHAT THE INVESTOR GETS IN EXCHANGE FOR HIS MONEY.

The interest on our Rail Road bonds, securities and loans during 1906 averaged only 3.9 per cent, which shows that these companies are getting the money for instituting these plants for the benefit of the public, far below the old and present legal and current rates, and the contract rates cited above.

Stocks at Premium. While bonds have had to be sold at a discount, contrary to usual belief, many of our well-known Rail Roads have sold millions of dollars' worth of stocks, both preferred and common, in the course of 20 or 25 years, at premium; that is, above par. In fact, within

the last ten years, approximately $1,500,000,000 of such securities have been sold at more than par. The entire proceeds were put into their properties.

Reducing Capital's Wages. It is believed that as wealth increases in years to come, interest rates will be lower, as they have gone down in the past with increased prosperity and further progress. Hence long term bonds are most attractive to the public, for they will pay rates which are now the standard at a time when a lower average will rule.



ENGLISH STOCK EXCHANGE, 1850 BANK OF ENGLAND, 1850

The Stockholder.

Uncertain Gains. The stockholder may receive returns, either great or small, or he may receive none. The bondholder must receive his fixed interest; in case of default, he takes possession of the property covered by his mortgage—the Rail Road. The stockholder, in that case, is "left in the cold." Later he receives such recognition as the reorganization committee sees fit to give him.

The stockholder takes a risk; the bondholder not so much, unless he displays poor judgment, or decreased business, increased operating expenses, reduced rates, too much regulation, excessive competition, division of traffic, inability to put itself upon a basis to cope with competitors,—all, or a combination of these, reflected in the Rail Road's earning power, make the property unprofitable and unable to meet its interest account.

A Losing Proposition. This, in the past, has unfortunately happened in many, many cases. How badly both the stock and bondholder frequently fare is shown in "Receiverships, the Ups and Downs of, and the Rich and Poor Rail Roads."

The protection of our laws made Rail Road securities standard, and second only to the issues of the various states and cities, and the national government, but much legislation has affected their place and standing.

NOR. IND. RY STOCK.

LEHIGH VALLEY R. R. STOCK.

Too Much Law.

Were you the investor, would the enactment of legislation which hampers operation and increases expenses, and the giving of the power to make rates, etc., to commissions not financially interested or not consisting of trained Rail Road men, make these securities more or less attractive to you?

Such things seem to threaten the value of Steam Road investment? May they not have a deterrent effect on further construction, mean the prevention of further development of idle lands and resources and hence cause stagnation, the opposite of progress and prosperity?

The Rail Road Investor.

There is a marked difference in the protection to the investing public in Rail Road bonds or mortgages and loans on various other properties.

Getting Money's Worth.

If the borrower who gives furniture as security does not pay interest, the property may be seized and removed by the mortgagee.

If there be a foreclosure on a dwelling, the mortgagee may rent or sell it, he may live in it, or tear it down and erect a new house. If the interest on a mortgaged storehouse be unpaid, the mortgagee may use it to advantage for some business other than that for which it was used unprofitably. If on a factory, the machinery may be moved to another place where conditions are more favorable.

If upon a farm, the mortgagee can use it for a pasture, turn it into a truck farm, or, if it is favorably situated, divide it into town lots. If on a vessel, it can be run on another line.

The Rail Road's Immovability.

If, however, the Rail Road be surrendered to the mortgagee, he can do nothing but operate it as a Rail Road. The cost of tearing up the track and leveling the embankments would scarcely pay for the value of such a long, narrow strip of land as real estate, particularly if the neighborhood is so poor as not to be able to support a Rail Road.

The Rail Road cannot be taken to another place, where it may be more profitable. If it is to be operated, the wages and other expenses must be paid, no matter what the returns

A White Elephant.

Rail Road investment is not a cat with nine lives. It has but one sphere of usefulness, and therefore lacks the elasticity and many ways of saving itself of other investments. It is less convertible, transferable or liquid, and consequently is more hazardous. Radicals even seem to feel that because the Rail Road cannot be taken away, it is fair to take as much of it away as possible by law or regulation. Conservatives say if this be possible, is it equitable? The principle that might makes right was supposed to have disappeared with feudalism, and to have no place in a republic and among a free and just people.

Earnings and Credit.

Without earnings in excess of its fixed charges no Rail Road will have the credit necessary to extend and improve its lines, so as to keep pace with the nation's progress.

Roads of any kind cannot be neglected; they must be cared for; their vitality must constantly be renewed by the diversion to them of new money. They are like an individual and must be fed to replace waste and wear.

Interest While Building.

Even while yet in the womb—that is, while in the stages of construction and growth—interest on that part of the capital already expended must be paid, although actual returns may not come for some time thereafter.

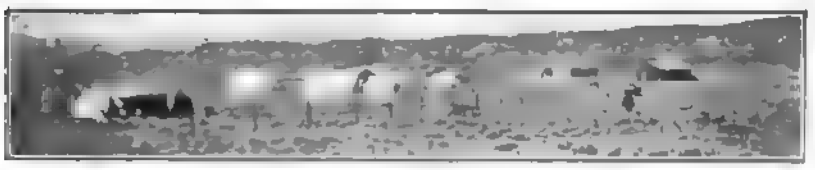
It should be remembered that the ratio of profits from Steam Road operation, as a rule, is not large. Therefore, the slightest interruption to these small gains causes a serious setback.

How small the earnings actually are is seen in "The Analysis of a Rail Road." The question whether the iron horse—the locomotive—will thrive on closely measured rations remains to be solved.

Limited Funds.

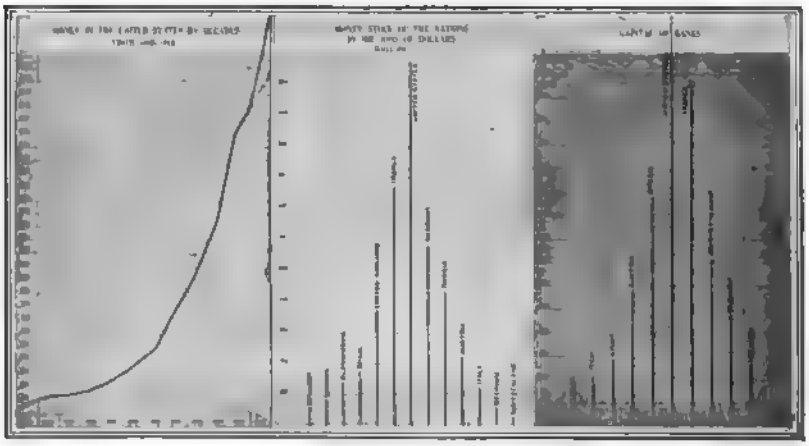
In 1830, which is the first census period in which American Rail Roads were given official recognition by the national government, the total circulating medium of the United States amounted to but $87,344,295.

It is seen that even at the cost of building Rail Roads in those days, as set forth in our section "The Cost of Rail Road Building at Various Periods," every dollar then in the country, if invested in Rail Roads, would have built little more than 2,000 miles of line. This lack of capital was one of the causes why Rail Road building proceeded so slowly.



A SURVEYING CAMP ON THE WESTERN PLAINS

In many cases, therefore, stocks and bonds, with a small percentage of cash, were traded to the contractors who constructed or equipped the Rail Road. These people naturally obtained as large a proportion of securities as possible, as the ultimate value of these was an unknown quantity, and they themselves had to find the market.



MONEY IN U. S. 3,100 MILLIONS IN 1910 U S HAD 2,350 MILLIONS BULLION CIRCULATION IN 1910. NATIONAL BANKS IN THE UNITED STATES HAD A CAPITAL OF 900 MILLIONS IN 1910

State Aid. As the companies had not the credit which invited private capital, states, counties and towns frequently assisted in the financing of Rail Ways.

The states most prominent in building or assisting in the construction of Rail Roads were Pennsylvania, Illinois, North Carolina, Tennessee, Georgia, Alabama and Virginia.

Profit Seeking. These contributions, whether in the form of lending credit or subscribing money or land, were not eleemosynary, but plain, common-sense business investments, concurred in and authorized by the people, either by popular vote or through their representatives.

The communities needed better transportation facilities to give their lands value, to make their towns grow and to market their products, and such facilities were furnished only by the Steam Roads. The money had to come from somewhere; so it was reasonable and logical that the chief beneficiaries, the people in the locality through which the road was to be built, contributed, if not individually, then collectively, toward their construction.

Community Contributions. The very same thing is done to-day, when people in a city or town subscribe a certain amount of capital to bring in a new mill or manufacturing plant which benefits the community as a whole. Frequently the town itself grants freedom from taxation, and sometimes even provides the site for the buildings.

There was a period when states, counties and towns actually vied with each other, and to their own best interests at that, in offering inducements and bonuses to the Rail Road builder or promoter who would furnish a part of the capital to provide them with rapid transit facilities.

Accrued Interest.

The result of such foresight is apparent to-day to anybody who sees a "Rail Roadless" town and a neighboring town that does have one. The difference between them is sufficient to make him realize that perhaps the Rail Road builder was not the one who gained the most from the partial contributions made to Rail Roads in early days in the form of land grants, or subscriptions to stock and bonds.

A RAILROADLESS TOWN.

THE ARRIVAL OF A RAILROAD TRAIN IN THE THIRTIES.

Taken into such communities blindfolded, the man of average intelligence, when the bandage is removed, would not need to be told which is the Rail Road town and which is without it.

Reasons of State.

At the time that the first steps toward the cultivation of the Western plains were being taken, the government was doing its best to give away land to whoever would take possession of and till it.

Finding that settlers would not come where there were no Steam Roads, the government gave some land to the Rail Roads to have them build and thus insure the settlement of the other portions.

In the case of government grants to the Union Pacific, the value of the alternate sections retained by the government was immediately advanced by it a hundred per cent, and in some cases many times more than this. Therefore, the land which the nation had left was worth more than the value of the whole before the road was built.

Business is Business.

The government policy, instead of being a generous one, was merely one of good business instinct, particularly as the Rail Way grants went only a few miles back from the lines, while the settlements made after Rail Roads were built might extend for many

miles more, affecting and giving value to vast areas. The Canadian Government has continued this practice for the purpose of developing its territory until it has become a settled policy.

Canada usually guarantees interest on bonds or advances a part of the cost of construction. Our government aided by land grants and by loaning bonds to the Union Pacific; but it got every dollar back, with interest.

The Construction of a Steam Road.

Making Estimates. Pending the financing, estimates are made of the amount, class and character of the material to be moved, the cost of clearing, grading, making cuts and fills, track-laying, equipment, grubbing, culverts, bridges, fences, ballast and the cost of getting supplies to the places of construction.

RAILWAY GRADING BY WHEELBARROWS IN THE PHILIPPINES

From the money received by a Rail Road, the first man to be paid is the laborer; then the supply man; then taxes for maintenance of state or local government; and, last of all, the investor whose faith and capital have created the Rail Road and given its facilities to the community.

Not First-Class Construction. As a result of the inability to secure sufficient money a number of our early Rail Roads were not laid out and built as they might have been. It was simply a question of building a road between given points, sometimes any old road at all, with such money as could be raised, just as the first common roads were merely rude paths.

Nearly all these roads, however, were up to the requirement at the time of the regions in which they were constructed. The cabin of the early settler did not have a hot water furnace or acetylene gas, but it served its purpose till he could get something better.

Growth. Later, as the country grew, the Rail Roads were extended, bettered or rebuilt, just as larger clothes are provided for the child as it grows older. It would be folly and waste of capital to buy a man's clothes for a

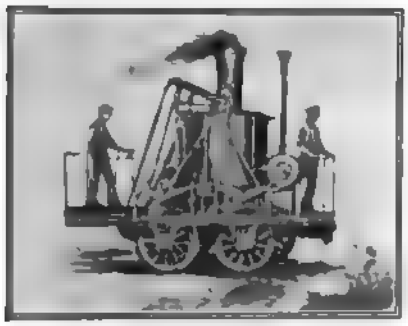
school boy, as it is not known how much he will grow, yet many people cannot understand why early Rail Roads were not built as they are now.

One very good reason for it was the same that prevented Columbus from discovering America in a 26-knot liner. Most of the appliances as now used were not known in those days.

The Child Versus the Man.

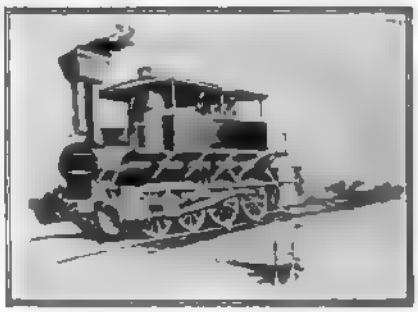
The Rail Roads of 1830 and those of 1840 were like children at one year of age and at five years, respectively; those of 1850, like a child at ten years; and the comparison might be brought down to to-day, when our best Rail Roads can be likened to a hale, hearty man of 35, in a high state of physical and mental efficiency.

Rail Roads and their appliances are the product of experiment, development and evolution. And if one will read the story of their growth and look at the pictures of what they were, he will know and realize how much they have grown and changed, how all their equipment that represented a large investment of money has had to be discarded and how great an amount of money has been required to transform the old style into the modern Rail Road.



THE "ATLANTIC," B. & O. RAILWAY, 1832.

WINANS' "CAMEL," 1848.



Finding the Funds.

A Real Task.

After the preliminaries just recited comes the important matter of securing the money for the building of the road. The men furthering a Rail Road must find a number of individuals or a banker who will take the bonds or stock, furnishing therefor the funds to grade the line, buy rails and ties, build bridges and stations, purchase engines and cars, etc.

Sometimes, when conditions are not favorable, this process consumes many years.

Not Road To Fortune.

Building the avenues of modern transportation has often been not the road to fortune, but the road to misfortune. Money has certainly been made out of Rail Roads, but in many, if not most, cases it is the same as with houses, of which it is said:

"The fool builds a house, while the wise man buys one."

The profits made by the Rail Road builders and Rail Road buyers are and should be kept distinct in our minds.

Rail Roads are in one respect much like mines, regarding which it is claimed that almost a dollar goes in preliminary work and sinking shafts and digging holes into the ground in trying to find mines on property later proving to be worthless, for each dollar that comes out of the successful ones.

The Chaff from the Wheat.

If all the money that has been expended on incorporation, surveys, right of way, grading, etc., for Rail Roads, and that lost by Rail Road builders, initiators, stock and bondholders, were deducted from the profits, there would be but a moderate balance on the credit side of the ledger.

The usual answer to a promoter's request to investors for money was:

"Yours is a new enterprise, and even though it looks good, we cannot afford to buy at par five or six per cent bonds on a road yet to be built, with no certainty of getting a return on our money. Bonds can be purchased on existing properties, paying the same percentage, for no more."

Below Par.

The result was that in most cases the company or its sponsors, in order to sell their bonds, had to dispose of them below their face value, or they could not have built the road at all.

Building a Rail Road is a venture, the returns from which are uncertain. In the early days it was more of a gamble than anything else. To offset this insecurity, the purchaser, capitalist or investor, for taking the risk, usually demanded a bonus of a large part of the equity or stock besides the bond which he purchased.

Based on Faith.

It should be remembered that the stock of new Rail Roads did not represent earning power, and until this was demonstrated it was of little value. They were simply pieces of paper, a silent share of a hope in a value yet to be developed.

CHAMBER OF COMMERCE, N. Y

SUB-TREASURY, WALL AND NASSAU STREETS, NEW YORK, 1866

CUNEIFORM INSCRIPTIONS. WHAT NOTES, CHECKS, DRAFTS, AND BILLS OF SALE LOOKED LIKE, 2000 B. C.

SECTION IX.

BANKS, BANKING AND MONEY.

Babylonian Banking Methods.—Substitutes for Money.

Banks and banking play a very important part in the story of the world's progress and prosperity, and something about them will be interesting and valuable. They are anything but of modern creation.

Babylonian Banking.

Archeologists have found tablets giving records of various banking transactions which took place in the reign of Nebuchadnezzar, 600 B. C. The tablets bear memoranda of loans of minas and shekels in varying amounts; the rates of interest in those days ran as high as twenty per cent. Certain of these tablets are in the Metropolitan Museum of Art in New York.

Many of the tablets bear the signatures of witnesses, and have other forms which show that the financial methods and machinery of that day were very similar to those of modern banking. They had simple obligations, like a promissory note, and one with a penal clause attached for non-fulfilment. There were obligations with a guarantee, like an endorsed note, others payable to a third person, as a check would be, and drafts from one place which were payable at another. It seems quite remarkable that obligations of this

FIRST UNITED STATES MINT, 1792, N Y. PRESENT U. S. MINT, PHILADELPHIA. AN EXAMPLE OF THE PROGRESS AND PROSPERITY.

kind, including letters of credit, should have preceded the use of coins. There were private banking houses in those days, the name of one of which was Egibi & Company, who seem to have acted as a national bank of Babylon. In Babylon interest rates were from 12 to 24%.

In Greece and Rome.

Later, in Greece, in the days of Cicero, one Atticus was prominent as a banker and lender of money, and engaged in many kinds of financial enterprise. Rome was assisted in its war against Hannibal by private individuals, bankers and men of means, who loaned large sums of money to the state. Rome had practically a money and stock exchange. Brutus loaned money at as high as 48 per cent interest. In Greece the usual rate was 12 per cent. We speak elsewhere of banking in Venice, Florence and other cities which were, in turn, the money centers of the world.

As business grew, it became necessary that every loan should be put in writing, and instruments detailing the amounts and conditions of the loans made came into existence.

Not Always "Forward."

A retrogression in banking methods seems to have taken place, for we find some of the banks in Europe, such as that of Amsterdam, more than two thousand years later, were simply great warehouses for bullion, which issued transferable receipts entitling the holders to the delivery of the money deposited therein.

Money in such a bank was unproductive. Instead of yielding a profit, it entailed upon the owner expense for guardianship and safekeeping.

Money.

The true definition of money is the name given to those substances which are employed as a medium of exchange and as a measure of value. Money came into use in the place of barter, which was awkward and inconvenient, as it was not always possible to find the man who had exactly what was wanted, in the quantity desired, and who was willing to accept in exchange the particular object which you had.

Substitutes for Money. Money has not always been gold, silver or bills, as it is nowadays, for the first money or medium of exchange that we know of in North America was wampum and dried codfish. Wampum consisted of small shells, black or white, strung like beads. The white was the shell of the periwinkle. The black consisted of the black part of the clam shell, to obtain or cut out which required considerable labor; it was, therefore, double the value of the white. It was strung on strings about six feet long.

Nature's Provision. The reader must not, however, believe that one could pick up wampum from the shore, and grow rich by making use of it as a purchasing medium. It was just about scarce enough to make it desirable for exchange, and as a substitute for money.

In the early days of Massachusetts' settlement three beads of black were worth a penny. A black belt of 360 beads was worth 10 shillings.

Primitive Bases. In the South tobacco was a favorite basis of values, and was often used as money in the payment of obligations, including even taxes and the minister's salary. In Connecticut and the Northeastern states, corn was the medium of exchange; in Tennessee, skins and furs served the same purpose.

Early in 1690, the colony of Massachusetts issued bills of credit to a considerable sum, making the paper legal tender for taxes and other debts. This was five years before the establishment of the Bank of England, whose founder is said to have watched the experiment and adopted its methods.

In fact, the modern English system of banking developed in the United States while they were English colonies.

Redemption Difficulties. During the war against the French in 1745, additional paper was issued by the state. This was redeemed later, with the help of $200,000 from England, at the rate of $11 of paper money for one of silver.

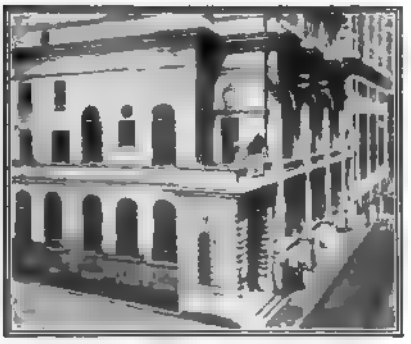
OLD U. S. BANK, PHILADELPHIA, 1831

TREASURY BUILDING, N. Y.

Other colonies also issued paper money, which was afterwards redeemed at extraordinary discounts. In New England eleven dollars, in North Carolina ten, and in South Carolina seven were redeemed by one. In New York, one dollar in coin was given for two in paper and in Pennsylvania, $1.80 was redeemed by a dollar.

Modern Banking. The business of receiving money is now universally combined with that of renting it out. The banker receives money in great and small sums which would otherwise lie, useless to the community, in the coffers of their owners, and lends it in certain portions to those who can afford to pay for its use, because they can employ it to advantage and profit.

Money thus becomes productive, and is a forceful agent of progress and prosperity. The farmer can borrow money to develop and improve his farm, the manufacturer to buy raw material to be transformed and the trader can enter the markets and purchase merchandise.



CLEARING HOUSE NEW YORK

BANK FOR SAVINGS, N. Y.

National State and Other Banking Institutions.

Minimum Risk. Our national banks are chartered by the United States under special requirements looking to the protection of their depositors. One of these is that they keep at hand 25 per cent of their deposits in the form of coin or legal tender, quite different from the methods of the old days of "wild cat and red dog banks." The bills of other banks, even, are not allowed now to be counted as a part of such reserves.

To prevent this large sum of money lying idle, it is sent, in part, to certain recognized reserve centers and agents, where there is a demand for money to be loaned on "call" to the dealers in certain "quick" assets, such as grain, cattle, cotton or standard securities. These can be sold at a moment's notice, and the money for them returned without delay to the bank, which may call for its funds at any time.

National Banks. The national banks can issue notes against government bonds deposited with the treasury department in Washington. They are subject at all times to inspection and supervision by representatives of the United States Government, and are limited by law, as we state elsewhere, as to the class of collateral on which they may loan.

The bank must be regularly chartered and have a paid-up capital. The public demands that every bank or banker have some capital, as few would be willing to deposit their money with a person not known to possess substantial assets. Without such protection, should the banker use bad judgment in loaning against poor security, the loss would fall entirely upon the depositor, and the banker could not make good. Hence arose the capital stock of banks, which is practically a guarantee fund. Thus the bank assumes liability for the safety of the money in its keeping, and the honest banker and board of directors have the keenest personal interest in the safety of the loans of the money in their charge.

State banks are chartered under the laws of certain states and subject to their rules, regulations and inspection, but with somewhat greater latitude as to the security on which they may lend money.

Limitations of Banks. Our national and state banks cannot lend money for 5, 10, 20 or 50 years, the duration of ordinary bonds, as that would tie up the banks' capital, so that in case of sudden need, they could not get the money when the depositor wanted it. The inability to collect moneys lent for even short terms is the occasion of the failure or suspension of many banks which suffer misfortune.

Trust companies, ostensibly organized to act as trustees or guardians, as a rule act much the part of the commercial bank, save that in many cases, they allow interest on deposits.

The Savings Bank. The fourth type of bank is the savings bank, the depository of the people, which loans for them and keeps their money earning wages. It is the bank of the home and the household, as the others are mercantile, or the banks of business. The collateral on which savings banks can loan is carefully restricted; they cannot go into new enterprises, or loan on notes or commercial paper; as a rule, money can only be put out on real estate, and securities approved by the banking department or the legislature. The least possible risks must be taken in making their investments.

Much of the money on deposit in both our national and state banks draws no interest, for the business man carries a certain sum of money in his bank, as he does in his pocket, for daily needs. While the individual could not afford to loan out money that might be called upon for the conduct of his business, when sums from many sources are assembled in a bank, it is found that a large portion of them can be loaned out, to keep oiled the machinery of progress and prosperity.

The Importance of Credit.

It has been wisely said that money is faith and credit. Nothing is more essential than their preservation. Our banks and banking are of paramount importance because they are the reservoirs in which we store our money to draw on when we want it, and if there be a leak or break in this great retaining wall, or if even a question arises as to its soundness and integrity, people become panic-stricken and withdraw their money, causing disaster to the country by an interference with the smooth running of the machinery of credit.

How great is our use of these reservoirs is shown by the fact that about ninety-three per cent. of our business is done with checks, that is, by means of substitutes for, rather than in money, further accentuating our need for faith and confidence in the intermediary institutions holding the funds represented.

Total Deposits.

Our national banks have deposits of six billion dollars, and our state banks, trust companies, savings banks, and other fiscal institutions eight and a half billions more. The capital and surplus of these institutions, $3,180,000,000, makes the total amount of money represented seventeen and three-quarter billion dollars.

There is, however, so little cash in the country that if the people of the nation were to join in demanding their deposits from the banks, an average of only seventeen and a third cents on the dollar could be paid, while, in actual gold and silver, only about thirteen cents could be paid.

Sextupling Our Funds.

This shows how our banks practically enable us to multiply our money six times. As long as credit is maintained, however, the total deposits are as available to the individual as if his share were coin in his hands.

Two Cents on the Dollar.

Against an estimated total property value in the United States of $130,000,000,000, there is but $3,106,000,000 of money, including $780,000,000 of paper not covered by gold or silver.

If for any reason, such as a panic or general distrust, everybody should simultaneously want to sell or realize on his or her possessions, the most disastrous condition would be created, for little more than the value of a postage stamp, or two and a half cents on the dollar of value, could be realized in cash.

Broadway at Wall street, New York, 1860

BROADWAY AND WALL STREET, N. Y. 1910. BROAD STREET BROADWAY LOOKING NORTH.

Maintaining Values.

We always speak of this man or that being worth so and so much money. As a matter of fact, however, a man may own property of a large intrinsic worth, but such under forced conditions, he could realize in actual money but two and a half per cent. of the wealth of which he is possessed. Only while credit is maintained are values sustained.

If the business men of the nation were to cease depositing for a single week, although making their regular drafts, the nation's money supply would be exhausted and the country financially wrecked.

A Delicate Structure.

It will thus be seen how sensitive a thing is our credit structure. Especially when we consider that in our earlier days, debts of a few hundred thousand dollars caused a number of our states to become bankrupt, can we appreciate how easy it is to destroy our money paying capacity. The banks are the keepers of the nation's purse, and it is to the self-interest of all those who have money in the banks, those who have property of any kind, as well as the wage workers, to give them proper protection, for the preservation and continuance of the nation's progress and prosperity.

The Private Banking House.

Its Special Lines.

There is a fifth wheel on our financial coach, which is also very important, namely, the private banking house. While occasionally accepting deposits, it is engaged principally in the business of a money merchant, that is, in the finding of money for new enterprises, or of new money for enterprises already established. It buys and sells the securities and obligations, not only of corporations, but of the national government, states, cities, towns, counties, school and other public corporations for the construction of public improvements of all kinds.

The business capital of the commission merchant lies partially in knowing where to sell and how to distribute goods. The money merchant's value lies in the same line; he knows who has money for investment and what securities are best suited to the different classes of his clients or other banking houses.

Unknown Field.

The average individual is not a good judge when it comes to the investment of his money. It is an old adage that "It is as hard to keep money, or invest it wisely, as to make it." The investor therefore relies upon the banker, who is, or should be, an expert in such matters; he knows that the banker must create and maintain good will by the quality of the goods he sells, as the sale of poor securities would soon result in the loss of reputation of his house. In the same way the selling of shoddy as all-wool cloth will cause one to stop buying goods from the merchant who substitutes.

Realizing One's Shortcomings.

The investor justly assumes that when a banker is putting out an issue of stock or bonds, or advises the purchase thereof, he has made an expert's investigation as to the merits of the property represented, just as the wholesale merchant makes careful examination of cloth before he adds it to his stock.

This is most necessary in the case of Steam Roads. When a man buys cloth, he can protect himself to a certain extent by examination of the goods, for he has the whole material before him. But the Rail Road may be one he never sees, located in a distant state, and even if he were to go over it, he could only see its physical side, and know nothing of the amount of business it may be able to secure, the expense of operation and the many other details which even experts can approximate only by a lengthy and thorough examination.

The private banker buys for sale to his clients an interest in or mortgage on a coal mine, Rail Way company, factory or public service corporation in the form of stocks or bonds. In this way it is possible to finance new companies with good prospects, and to obtain additional capital for established enterprises, and money making investments thus are enabled to earn remunerative rates of interest. In other words, the banker is the man who "passes the hat" and gathers together funds from many sources, not only here but all over the world, for the progress and prosperity of our country.

Common Sense.

The gist of the matter is that the prudent and conservative investor wants some one who is an authority to advise him as to the quality of the prospective purchase, as a veterinary must pass on a horse before the shrewd farmer will buy it.

The Reason for the Private Banking House.

If all investors would ask the advice of reputable bankers, private or national, millions of the savings of the thrifty would not go into wild cat mining and other schemes, widely advertised in

our newspapers by financial quacks masquerading as bankers and financial authorities. Our postal authorities happily are taking a hand in exposing the fakers.

Moderate Profits.

The profits of the bankers or commission houses for handling securities of well-known Roads, or what are termed standard or savings bank securities, are very small, amounting sometimes to only a fraction of one per cent. If the moral indorsement of a banker of high reputation adds to the market value of a security an amount greater than his commission, it cheapens the cost of money secured, thus rendering a public service.

Illinois Trust and Savings Bank, Chicago.

The banker at times received as part or all of his commission a block of stock. This practice is gradually disappearing, however, and to-day little of such bonus is given.

Sharing in Future Gains.

In the days when this practice was generally followed, the banker got the stock because he staked his reputation on property in a new and undeveloped region. To-day he usually has to buy the bonds outright and take chances on selling them.

The many bonds financed by a single firm are not actually taken by them, for an issue such as is frequently made would absorb all the available capital of the strongest banking house.

These issues of bonds or stocks are generally bought or underwritten by one or more houses, then subdivided among other firms, and by the latter again distributed through a thousand channels among their customers and private individuals throughout the entire nation, and frequently abroad.

Conservatism Necessary.

It is but natural that a single house cannot afford to put all of its money into one enterprise, for it might then be compared with the merchant who invests all his capital in a single style and make of goods, having no variety. It would mean "putting all the eggs into one basket," and if anything should happen to the one issue, the firm involved would find itself practically bankrupt.

The Broker.

The stock exchange brokers are but commission merchants between the sources of supply and demand. The banker is frequently confused with the broker, although some of the largest banking houses do no brokerage or stock exchange business whatever.

Brokerage. It is rightly considered most reprehensible for a broker not to execute the order of his client. Although this is sometimes done, it is against the rules of all exchanges and the houses guilty are expelled if the fact develops.

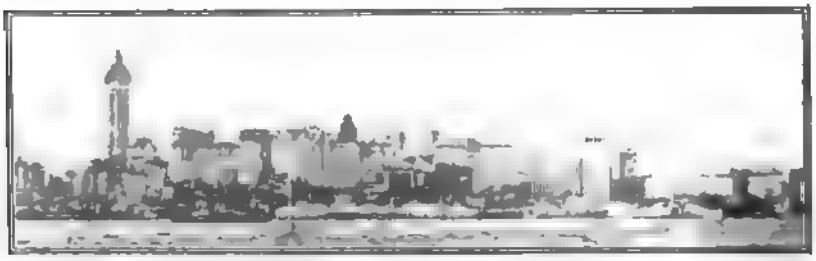
The man who receives an order without executing it is a mere gambler, who, in effect, wagers with his customers that the judgment of the latter will prove wrong. The percentage of the commission is in the favor of the broker. This business is known as a "bucket shop."

Each in His Place. The buyer who purchases in large lots for future use or for sale is as essential a factor in commerce and the community as the seller. Without such a buyer a great hardship would be done to the person forced to part with his goods at short notice, for only those would buy them to whom they were an immediate necessity.

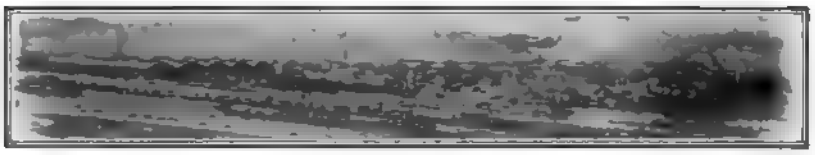
Any man who purchases to resell at a profit is a speculator. There is nothing new about speculation. Pharaoh speculated in grain, cornering the supply and making Joseph his caretaker. It is sometimes necessary for the speculator to prove his confidence in property before the public will believe in its value.

Failure to Realize Value. A friend of the writer's recently went to a comparatively small city and bought for $150,000 a piece of property which had been a drug on the market for many years. When a stranger paid so much money for the land the people of the city "smelled a rat," and then for the first time began to show an interest in the property. Several offers for it came from local people, and finally one of $250,000 was accepted.

The speculator, in some form, is found in every community, from the man who "swaps" jack-knives to the dealer in farms or real estate. He is not a product of Wall street, but of human nature. The writer does not mean to countenance excessive specu-



THE MODERN SKYLINE OF LOWER NEW YORK.



PLANT OF THE PRESSED STEEL CAR COMPANY, NEAR PITTSBURG, PA.

lation, particularly the cornering of food products or cotton, but it must be remembered that a large portion of the country's crops is marketed shortly after it is harvested, and buying and holding are necessary to prevent their being sacrificed when they come upon the market in excess of the current demand.

The Centers of Business.

In the United States there are various places known as the principal markets for different things. For instance, Chicago and Kansas City are the great grain and cattle markets of the country; New Orleans, Galveston and Memphis, the great cotton markets; Pittsburgh and Cleveland, the steel and iron markets; Boston, the leather market; Norfolk, the great peanut market; Elgin, the butter market; Glens Falls, the cheese market; St. Louis and Kansas City, the great mule markets, while New York, Chicago, St. Louis, Boston, Philadelphia and a number of our other cities are the great money markets, New York the greatest of them all.

Bulk is Economical.

In many cities there is a constant need of large sums of money for short periods, to handle the products traded in. Not only the people in the cities, but those from all over the country, including the grain dealer, the manufacturer and the merchant, go to these cities to buy the use of large sums of money, which might be beyond the resources of their local banks, and it is to these cities that the people from all over the country send their money to have it marketed and to buy securities for more permanent investment.

Selling by the country or town auctioneer has never been questioned. Stock selling, as done on the various exchanges of the country, is practically the same thing. The stock buyer or investor, like the dealer in any of these commodities, would not purchase a share in a Rail Road or other corporation if there were no place to sell the same. He differs from other dealers only in the nature or quantity of his operation.

Special Markets.

Mules and cattle are sold in Kansas City and St. Louis and horses in New York by auction; auction rooms in every town sell household and other goods; the auctioneer even goes to the farm or household to sell its surplus stock Those who understand the auction room for the daily sale of securities, the stock exchange, realize how desirable and necessary legitimate transactions in securities are in the many contingencies requiring the immediate use of money, such as the closing of an estate, the reorganization of a business, the quick realization on collateral by commercial and savings banks, etc.

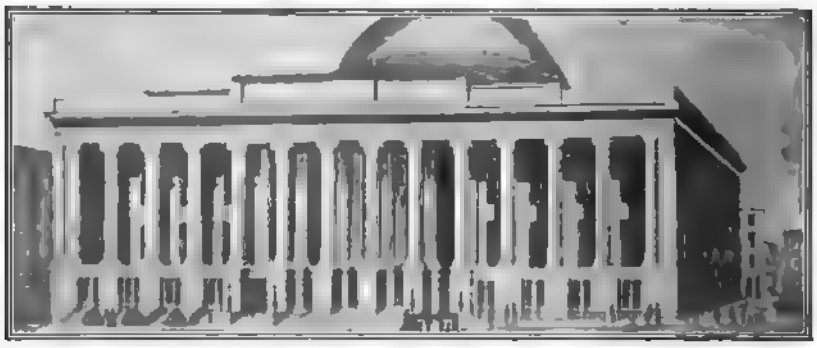
Going, Going, Gone.

The stock, cattle, produce and cotton exchanges of the country are only auction rooms on an extraordinarily large scale. Instead of crying the price up, the seller usually starts at a higher price than he expects to get, and cries down until he finally finds a purchaser.

The conduct of a banking or brokerage house requires the expenditure of large sums of money.

A certain prominent banking and bond house, one not doing any brokerage business, has no less than 200 representatives or salesmen, resident or traveling, throughout the country. This does not include the minor employees. Yet this house is one of the most conservative, restricting its business dealings almost entirely to investment securities of standard rank and earnings.

It is thus easy to see that selling stocks and bonds is no child's play, and that it is of considerable credit to a Rail Road if a banking house will undertake to dispose of its securities for a small commission, involving, as it does, the service of a large and valuable machinery and capital, necessary at many times to the progress and prosperity of our business enterprises.



THE OLD MERCHANTS' EXCHANGE, NEW YORK

FIRST UNITED STATES CAPITOL, (N Y.). PRESENT CAPITOL, WASHINGTON. A STRIKING CONTRAST.

SECTION X.

THE ORIGIN AND ANALYSIS OF THE CORPORATION.

Co-Operation.

If our progress is not to be restricted, and if our prosperity is to be boundless, primitive machinery for the production of wealth must be done away with. In accordance with this principle, individual effort has given way to concerted action. In nearly all industries, metaphorically, the pick has been replaced by the steam shovel.

It is perfectly natural that in the formation of business partnerships the same principle be applied. Yet the mere word corporation, a business partnership composed of 20, 200 or 2,000 instead of two partners, makes us regard it differently.

Lighting the Dark Places.

To throw light upon the corporation, one of the commonest factors in our every-day affairs, and one of the most important in modern progress, and to permit of discrimination in judging it, is a public service of value.

Strip the corporation of its name and what do we find? Only a simple business partnership of our neighbors and ourselves.

Our Country a Corporation.

What is the United States but a corporation, a holding company made up of other holding corporations, states, which are constituted as below?

First, there is the school district, the road district or the township; sometimes there are two of these small corporations, or even the three, and frequently they are co-extensive. They constitute the basic public corporations, organized for purposes of immediate self-government, public education, construction of roads or other local improvements.

Second, a number of townships or districts get together and form a county, or, strictly speaking, a county is subdivided into them.

APPIAN WAY AND AQUEDUCT MANY OF THE GREAT PUBLIC WORKS OF ROME WERE BUILT BY CORPORATIONS.

Holding Companies. Third, the counties in turn make up another corporation, a holding company called a state. The United States is a holding company of holding companies, and has its jurisdiction defined so as not to conflict with the powers of the states, counties, cities, townships or districts.

Boroughs, villages, towns and cities, combinations of people within those other corporations, are known as municipal corporations, and further complicate and enlarge our great system of corporations.

The Status of a State. The state is practically a large trust acting under a constitution and by-laws, or charter. All the people of the state are stockholders and partners in at least four, and if living in towns, in each of five public corporations.

It seems, therefore, that the modern corporation is simply representative government applied to business.

If you are skeptical whether you have an interest in a corporation, just analyze what you do when you cast your ballot.

First, what gives you the right to vote? Is it not the fact that you are a citizen-stockholder in a corporate body and have a right to voice your choice in the selection of the directors to conduct the affairs of your concern and shape its policies? If you live in a

city, you vote for an alderman, a director of the municipal corporation and the representative of your ward.

Care of Your Interests.

When you vote for the mayor of your city, you vote for the head of that corporation. When you cast your ballot for the state senators and representatives, you exercise your franchise in the selection of the directors of the state corporation in which you are interested, and when voting for the governor you vote for the president or executive.

When you vote for your member of Congress, you vote for a director of your great national corporation, and when voting for the president, though indirectly, for the executive thereof.

Indeed, our government is so planned as to be far more complex and irresponsive to the opinions of those who are interested in and control it, than is even the largest business corporation.

An Ancient Institution.

It is common belief that the corporation is a creation of recent years or modern finance. As long ago as the days of Rome, probably as early as the Christian era, however, corporations or collegii, were recognized by law as persons entirely distinct from their members. These corporations could be composed of three or more persons. They had their money chests or treasuries, could sue and be sued, and were incorporated by public authority.

A large number of these colleges or corporations were for mercantile purposes, and it is said that many of the public works, roads, aqueducts and other enterprises of the Romans were built by them. This form of corporation endured after the death of its founders and its shares could be sold or willed.

Means of Carriage in old Calcutta

Starting the Machinery.

As early as the fifteenth century, the stimulus of increasing commerce and extensive business led to the subscription of capital from many sources for the conduct of large enterprises, the joint ownership being evinced by certificates. Thus arose the mechanism from which profits may be obtained through the efforts of others directed by an intermediary

Corporate Pioneers.

The machinery which England used in gaining her tremendous possessions and in founding her colonies was the chartered or joint stock company. Three of the most important at the end of the seventeenth century were the East India, the Royal African and the Hudson Bay companies, the last of which is still a power in Canada.

Largely through these companies England won India and her great North American and African possessions. The most successful of her early colonies, and many of the settlements in what is now the United States, were founded by and for a time were conducted as chartered companies. This form of business venture, therefore, has not been merely local, but national, and even international in its scope.

Corporate Taxes.

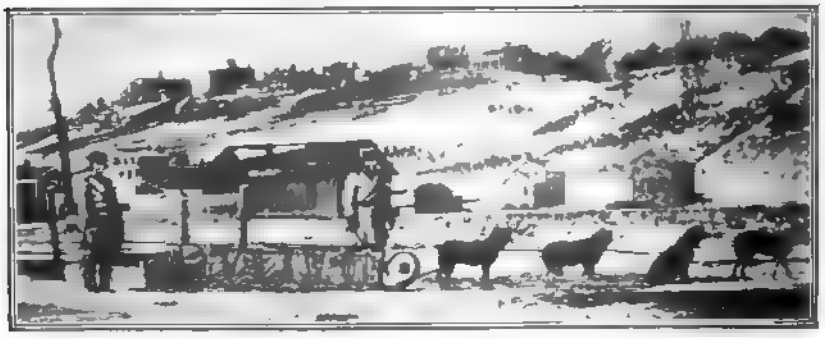
There are no less than 231,243 business corporations in the United States, who pay the government a yearly tax of $26,000,000, and the various states a tax aggregating much more. In fact, in a single state, for the intangible privilege of doing business, $5,500,000 is paid by corporations, which pays the state's administrative expenses and a large part of the cost of maintaining its public schools. Hence the corporations save many taxes from being levied on individuals or property.

Impractical.

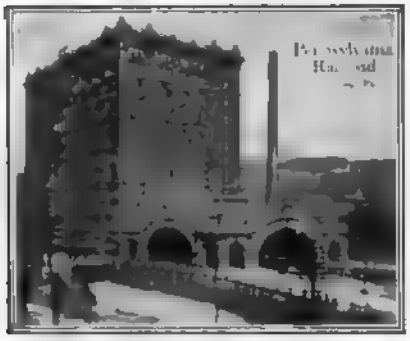
Perhaps it is because, as Spencer claimed, we seem to take pains to inform ourselves principally on the objects of least real value, that we have not posted ourselves more fully upon, or analyzed more carefully, the real facts in regard to corporations. It is possibly on this account that there exists an antipathy against any business, and particularly that of transportation conducted in corporate form.

The Corporation a Business Concern.

By becoming corporations, land or water transportation or other companies do not place themselves beyond the reach of the law. Corporations are subject to visitation by the state creating

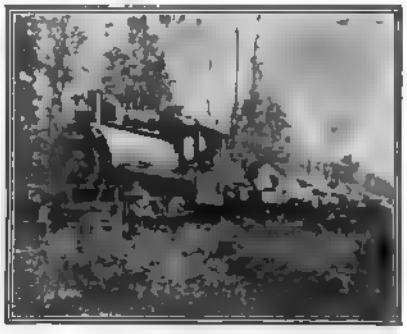


DOG TRAIN, HUDSON BAY TO ST. PAUL, 1859. THE HUDSON BAY CORPORATION FIRST EXPLOITED THIS PART OF THE NORTHWEST



PENNSYLVANIA RY. STA., PITTSBURG.
THE PENNSYLVANIA RAILWAY HAS 60,000 STOCKHOLDERS.

PRIVATE LUMBER ROAD.



them, and they cannot refuse to answer questions on the ground that it would tend to incriminate them as can the individual.

Amenable to Regulation.

An ordinary citizen has a constitutional right to do business in any and every state in the Union, but some states may bar out corporations of other states.

While the individual may use in his business as much money as he pleases, the state has power to limit the capitalization of corporations. It may refuse permission to mortgage the property or it may limit the length of the life of the corporation.

Business corporations thus seem to be more subservient to the rule of the people's corporation, and to such bodies as the latter sees fit to appoint than partnerships or individuals.

Not Subject to Rule.

While corporate Rail Roads have every limitation placed on them, the writer has known certain privately owned lumber roads in the West and South, which charged what they please for freight and passengers. Neither legislatures, courts, Rail Road commissions, nor the Interstate Commerce Commission interfered.

Many criticize corporations because their stockholders' liability is limited.

Would anyone living in Baltimore invest in a Rail Road in Oregon, or some distant state or locality, if he thereby became a general partner, and if, in the case of failure of the enterprise as a general partnership, his home and all he possessed might be taken from him? Under such conditions there would be very limited transportation investment, and consequently few Rail Roads.

Preserving a Distinction.

A man risks all that he puts into a corporation, but no more, just as in case of the failure of a bank in which he deposited money he would lose only what he had deposited, and not so much of the rest of his property as would be required to make up for the bank's deficit. Were it otherwise, we would have few depositors in our banks

So far as partnerships among individuals are concerned, a limited liability partnership may be formed by putting the word

"limited" after the name of the firm. This limits the liability of the partners to the capital of the firm. A "special" partner likewise has limited liability.

Limited Partnerships.

A transportation corporation is practically a legal form of limited partnership, in which the interest of the stockholders or partners is represented by certificates; the shares are transferable merely by assignment of the certificate.

It is also desirable to organize public carriage companies as corporations because partnerships of 10,000 and 20,000 men and women would be unwieldy.

It was customary in times past, and still is the custom in New England states, to own a share in some local vessel. The value of such a ship is easily ascertainable, and could be transferred as an entity or in part without much difficulty.

Impossible to Convey.

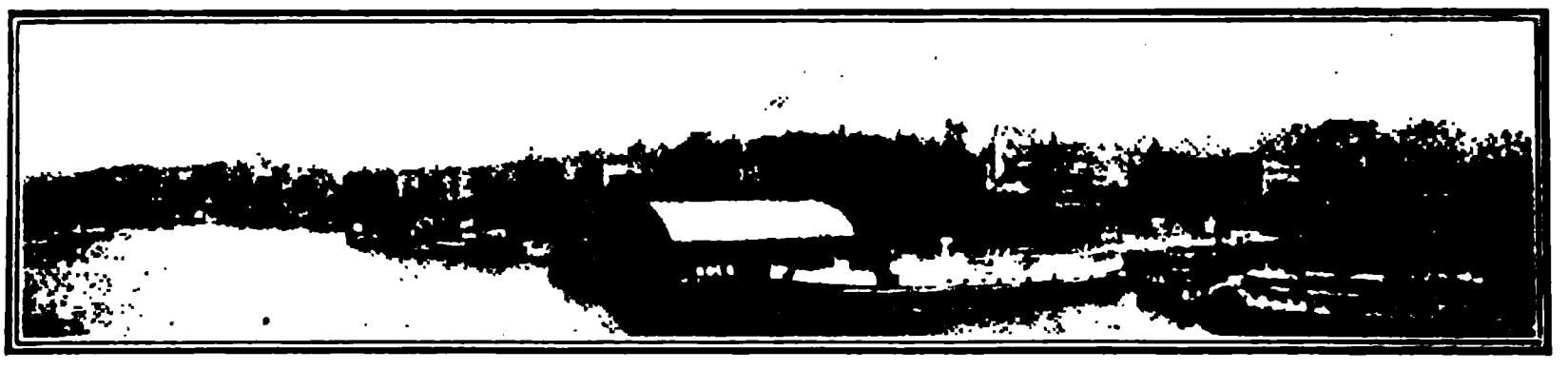
But the value of a ten-thousandth interest in thousands of miles of Rail Road, located in many states, is a different thing. Would it not be impossible to ascertain the exact value of, and convey by deed or otherwise, an interest in each water tank, station, spike, piece of ballast, and other property composing the road?

A Steam Road belonging to one person to-day might to-morrow, by his demise, become the property of many heirs, all tenants in common, each of whom would have equal power, against the consent of one of whom not a single engine or car could be run.

Numberless Partners.

Or, suppose a Rail Road has 60,000 partners, which is the number of stockholders in the Pennsylvania Rail Road. In such a case, several partners would be dying every day, and as the death of a partner dissolves a partnership. the estate would have to be closed several times each day and its total value, assets and liabilities at the moment of the passing away of each partner ascertained.

The life of a corporation, however, is for a given number of years. Hence, the death of an individual or even of all stockholders does not end its activities and usefulness.



THE PORT OF SEATTLE.

The Why and Wherefore.

Men and Women.

What is a corporation, therefore, but an association of men and women, with the right to do certain business, who, over-busy with their own affairs, combine some of their capital and intrust the conduct of its management to officers chosen by themselves?

Is a corporation any more rapacious or exacting than the persons who compose it? Is it not by means of corporations that the United States exists, and under and largely through them that it has become the most prosperous and foremost power in the world?

The Democracy of Corporations.

Were it not for the device known as the joint stock company, our progress would have been slow indeed. The stock company enabled contributions from the rich and the thrifty of moderate means to be joined for the development of our country.

The corporation enables small investors to combine their means for transactions of considerable magnitude, competing with millionaires with large funds at their disposal. As a matter of fact, the nation is owned, in far greater part, by the small investor.

Making Bankable.

A most important reason for incorporation is that a provision of our national banking laws forbids a national bank to lend on or to become interested in any way in a partnership per se. Therefore, money cannot be raised upon the interest of one of a number of partners owning a transportation company. Our savings banks have the same limitation.

As a result the vast investment in Rail Roads and industrial or mercantile establishments would be prevented from being used for the raising of funds necessary for the expansion of credit or for temporary individual needs. It is the corporate form which enables these industries to be brought within the pale of banking transactions.

The Trust vs. the Corporation.

The Bold, Bad Trust.

It has become common practice to speak of corporations and combinations of corporations as the same thing, and many people have ceased to observe, even if they realize, the distinction between the terms "corporation" and "trust." "Trust" means any combination of corporations, industries or individuals sufficiently large to affect or seriously control production or prices.

Frequently the trust is organized as a corporation. This is almost an absolute necessity, because the various businesses which, by joining together, compose it, demand representation in its affairs, and this can best be done by incorporation.

Hasty Conclusions.

As it is the trust form of corporation which is attracting so much attention and condemnation, the public has been quick to infer that every corporation is a trust. But this is by no means the case. Tens of thousands of corporations exist that are not trusts, nor in any way involved in the "trust" question.

A trust prevents competition, but there is keen rivalry among most of our carrying companies.

Many of our charitable institutions, universities, fraternal organizations, clubs and churches are corporations. These must assume the corporate form to be relieved of taxation. It is usual, however, to go a step further and to amalgamate all the churches

of one denomination, or even all those of the same general religious belief.

There Are Men and Men. Just as there are good partners and bad partners and partnerships, so there may be "good" corporations and "bad" corporations. There is no reason why all corporations should be called bad, any more than because there are men who are criminals, all men should be called bad.

Lions and tigers belong to the cat family, but we would not think of banishing the "tabby" from the fireside for that reason, nor try to walk on all fours because a certain scientist has discovered more or less recent relationship between the simian and ourselves.

Justice. The old Saturday night spanking for faults which the children might have committed has been given up, and to-day we try to mete out punishment only and properly where it is deserved.

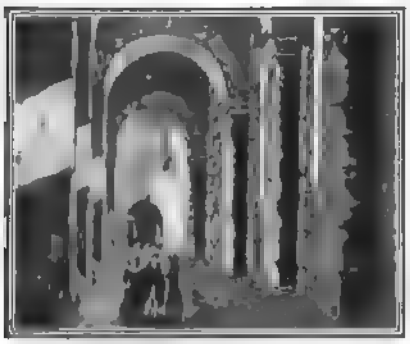
Let us busy ourselves with the future, and attempt to fit our understanding and our acts to the newer, greater standards, and so gain a true knowledge of the every-day machinery through which many of our greatest improvements have been wrought.

Progress and prosperity, in working out the destiny of the nation, will frequently have to do so in corporate form. We must realize this and learn to distinctify between mere machinery and men who may abuse it

COMBINATIONS AND CONSOLIDATIONS.

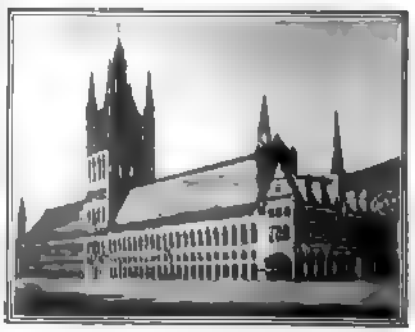
Progress and Prosperity. There is in the atmosphere of to-day dread of combinations. The belief at times seems almost general that combinations of transportation companies constitute, or eventually will constitute, a single trust and by means thereof menace the progress and prosperity of the nation.

Let us look into the past, and see what examples history brings down to us of the tendencies of men in this direction.



THE CATACOMBS WERE THE REFUGE OF THE EARLY CHRISTIAN SOCIETIES.

A GUILD HALL YPRES, BELGIUM, 13TH CENTURY



LÜBECK IN 1650, THE CAPITAL OF THE 80 HANSA OR TRADE LEAGUE CITIES.

Religious Consolidation. The consolidation of reverential thought and feeling into the religions of the world is a tendency old as recorded history. The same religion is often ramified into many sects of the same general belief; and these are again divided into the more readily identified and familiar units of congregations.

The Catacombs. Under the wings of the early burial societies, Christianity found refuge during the trying times of the first three centuries after Christ. The catacombs of Rome, which harbored the Christian in the times of persecution, to-day are mute, visible testimonials of a type of combination and co-operation. Non-Christian religions also have had their crises, and only survived through combination among their adherents.

Every race is or was a consolidation. The earliest Aryan combination was patriarchal, under the chieftainship of the oldest member of the family. Then families grew larger and formed tribes, as the twelve great families of Israel, who formed the Jewish nation. Of this form the Scottish clan of families is a relic. The enlargement or outgrowth of tribal government resulted in the formation of nations.

Trade Guilds. The union of man for the enlargement of trade is not a new tendency or a creation of modern finance. It is believed that Roman trade corporations existed as early as the beginning of the Christian era, and that these formed the nuclei of the trade guilds of a later date. We have also shown that the corporation dates back to the days of the early Romans.

The members of the guilds were pledged to assist one another to further the interests of their particular industry. In England they were important as early as the seventh century; by the twelfth century trade and craft guilds had become semi-public bodies.

A Great Power. Later, the guild was practically a chamber of commerce. Venice, many of the "Free Cities" of Europe and the "Eighty Cities," or Hansa towns, which defied or made war on rulers and were free and independent

in the midst of monarchies, were practically governed by such organizations.

The Labor Union. The modern union had its birth at least as early as the thirteenth century, when the Meistersinger grappled with the problem to prevent the decadence of music, to bring about a renaissance of this and kindred arts and to serve and protect their members.

Brotherhoods are at least as old as religion, for nearly all of the pagan religions had and still have orders or brotherhoods of priests and devotees. The Christian brotherhoods practically had their genesis A. D. 315 with the brotherhood founded by St. Anthony. Later came the first international brotherhood, under the name of the Crusaders, whose purpose was to recover the Holy Land.

Reversing the Picture. In darker Africa consolidation has as yet reached only the tribal stage; consolidations of capital are unknown. Coexistent with this primary stage we find poverty, ignorance and an absence of development, civilization, comfort and refinement. Like conditions exist in other regions which fail to apply the "get together" principle of civilization.

Our own form of government makes every man an active, or at least a semi-silent, partner in the national concern. The aggregate wealth of the individual stockholders determines the economic and social status of the nation.

More Light. What was our civil war but a war to prevent the withdrawal of some of the states from the great national partnership and combination called the Union? More than half the partners in the Union were opposed so strenuously to the dissolution that they fought to prevent it, the struggle which resulted causing the sacrifices of a million lives and, according to estimate, $10,000,000,000 of private and public treasure.

The tendency toward consolidation is shown in the name of our country—the United States. Then we have Greater New York, Greater Chicago, Greater Pittsburgh, etc.

The Reasons for Rail Road Consolidation.

Combinations. It has become popular to consider the combination of several Steam Roads to form a single large line as detrimental to the interests of the public. The impression frequently exists that the only reason for Railed Road combination and consolidation is a desire for stock jobbery. Consideration of this subject seems pertinent and desirable.

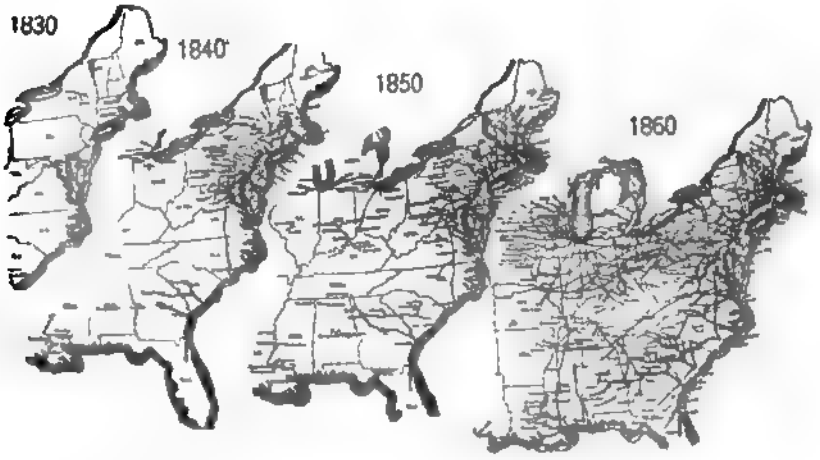
Assuming that each of us works from selfish motives, still that selfishness must be enlightened selfishness, for we are all bound together by the laws of nature. In order to succeed and win our bread we must think for and benefit others as well as ourselves. Herein lies the guiding principle of combination: co-operation toward a common end.

The Reason. The reason for the consolidation of transportation systems lies in the necessity for enlarged facilities, as the trade of the country served by the Rail Road increases and the road's business naturally grows.

The first combinations were in the form of alliances between separate lines, which may be compared with alliances between nations. There were also reciprocal agreements for the exchange of freight, just as our government has reciprocal tariff treaties with other nations.

Protecting the Supply Line. When competition became keener, Rail Road wars resulted, which necessitated the protection of the Rail Road's connecting lines, so that traffic might not be diverted elsewhere. This is as important in a Rail Road war as in a war between armies; connection is as necessary as between our arteries and veins.

In the case of a small Rail Road, it must depend for its traffic, to a great extent, on connecting lines, which may favor another road. The strengthening of the connections with these Rail Roads has a most important influence on the stability of the income of the smaller line.



THE RAILWAY MILEAGE INCREASED FROM 30 MILES IN 1830 TO 30,000 IN 1860. THERE WERE NO RAILROADS FARTHER WEST THAN MINNEAPOLIS IN 1860.

A Rail Road extending only from Syracuse to Rochester, in the state of New York, if there were a parallel line, could absolutely depend upon little through traffic, unless it controlled or was in harmony with feeding connections at either end.

The Lesson of Precedence. The public to-day would not be long in choosing between the present connected system and the old condition of affairs, when our Rail Roads consisted of separate units, a situation accompanied by many discomforts, poor time, poor service, frequent changes, inadequate equipment and greater cost.

The Erie Rail Road through New Jersey and New York was

built to secure for New York City the trade of the southern tier of counties, and to put them on a par with the northern tier, cut by the Erie canal, and served by the New York Central Rail Road. To prevent any of this traffic being diverted from New York City by connecting lines, the Erie was built with a six-foot gauge, instead of the standard gauge of four feet, eight and one-half inches. Further, the road was forbidden, under penalty of forfeiture of its charter, to make physical connection with any other road.

Loose Links a Poor Chain.

Originally there were eleven separate and distinct Rail Roads between New York and Buffalo. Eleven bills of lading were necessary for every shipment of freight and eleven transfers required. A bill of lading had to be made out at each place where the transshipment was made, and therefore an attendant had to accompany each shipment, or it was necessary to have agents stationed at each of the transfer points to secure the new papers.

At most of the towns, there was not even physical connection between the different lines of Rail Roads. One road would come in on one side of the town and another road would go out at the other side. Passengers had either to walk or ride across the intervening distance, and freight had to be transferred in wagons. Time tables were not always harmonious, and in addition to the inconvenience of the transfer, there frequently were tedious and costly delays.

CROSSING THE ISTHMUS BETWEEN RAILROADS

The Fight for Consolidation.

An Uneconomic Combination.

In 1846 the Erie & Northwest Rail Road was built, twenty miles long, and with a six-foot gauge, to fill the gap between the Dunkirk and State Line and the Buffalo and State Line, both of which had been built at the standard gauge, the three roads forming a series across the state.

Middleman's Profit.

The transfer of baggage, mail, express, freight and passengers, necessitated by the different gauges of the Erie and Northwest and its two connections, was exceedingly profitable to the owners of the hotels, omnibuses and drays of Erie, Pa. When a proposal was made

to change the gauge of the Erie and Northwest to standard width, they knew the change would destroy this source of revenue, and feared, if through trains were run, their town would become a "Hermit by the Wayside."

As neither bribes nor threats succeeded in getting the Rail Road to change its plans, the town council of Erie passed an ordinance which forbade the company to change the gauge of its tracks under severe penalties.

By Right of Sword.

When, nevertheless, the Rail Road started to change the gauge, a procession led by the mayor of Erie marched to the track, drove away the construction gang with a shower of stones and ancient eggs, and tore up the rails. A similar mob at Harbor Creek, seven miles east, tore up the track at that point. Guards were posted to prevent the relaying of the rails.

This caused a gap of seven miles, across which all passengers and traffic had to be transferred through deep snow, in bitterly cold weather, causing many of the unfortunates to have feet, hands and faces frostbitten. At the time this was termed, "crossing the isthmus."

When a United States marshal attempted to serve an injunction on the leaders of the mob, to raise this embargo on commerce, the document was trampled under foot in token of contempt for the courts, and the marshal and his deputies were imprisoned.

Improved By Age.

Eventually such short-sighted local selfishness and prejudice were overcome, so that to-day a person can buy a single ticket and step into a car which will take him from New York to Buffalo, Chicago and St. Louis, and from St. Louis to the City of Mexico or San Francisco without change.

The same is true of freight shipments, one bill of lading covering the entire distance, and carload freight, in most cases, crossing the entire continent without transshipment.

Reason for a Through Line.

A Rail Road which, even if it does not own, can control lines all the way through, say from New York to Chicago, can offer the shipper quick and safe dispatch of freight, and to-day speed and safety are the cardinal attractions offered in transportation.

The Change.

As long as the Rail Road service ran in detached sections, each section worked by a different administration, the general service was most inefficient and unduly costly. The consolidation of through lines from the prairies of the West to the markets of the East enabled reduction of freight rates to the benefit of the farmer and manufacturer and resulted in reduced cost of supplies to the consumer everywhere.

In early days the freight on a barrel of flour from Wheeling, W. Va., to Baltimore, was $4.00. In Baltimore the market value of the flour was $5.00, and the producer's return of $1.00 was scarcely an incentive to production. As late as 1870 the consumer in New York City paid $1.60 for the conveyance to him of a

barrel of flour from Chicago. In 1880 he paid only 86 cents for the same service. To-day he pays about 50 cents.

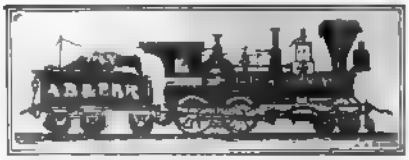
Some Detriments of Non-Consolidation.

A Poor Road. The writer had occasion to travel over several lines of Rail Road a few years ago that touched, but were not consolidated with a larger and important road. Part of this trip was made over seventy miles of little better than two cross-country streaks of rust. It is an interesting coincidence that this was in a state which had been most insistent on the reduction of Rail Road rates by legislative action.

The trip was made at the break-neck speed of something less than seven miles an hour. The interior of the cars would not have furnished a prize dog, or even a dog whose family tree would have been difficult to climb, a decent kennel; the decorations and coverings had been torn from the roof, sides and seats; the cars were exceedingly filthy, leaky and dilapidated, as rickety as the "wonderful one-hoss shay," and apparently ready to imitate that vehicle by threatening to go to pieces at any and all times.

The rails themselves were too poor and light to make it possible to run a heavy sleeping car over them.

When Truth Seems Fiction. The engines of this road were so old that when going up a hill in one part of it they would coast full speed down a little grade which happened to be just in front of it, trying to overcome the hill, much as a runner takes a "running jump" over an obstacle placed in his path.



AN EARLY WOOD-BURNING LOCOMOTIVE.

LUMBER ROAD, WASH.

OVER A POOR ROAD.

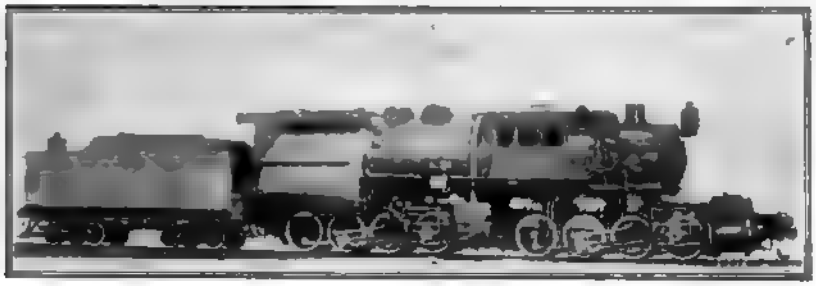
Sometimes the train failed to ascend the whole hill, notwithstanding the added momentum, in which case the engineer would back to the top of the grade and try again until he got over it.

Sociable Rail Roading. At the Rail Road crossing of an equally luxuriously equipped and independent line two trains met; everybody stopped and went to dinner for an hour or so. After discussion of all the local and Rail Road news, and when popular topics had been exhausted, the engi-

neers got aboard and the teapots of engines, hauling their trains of chaises, were started on their painful journeys again.

The average individual, whose time is of value, but who, for lack of better facilities, has to travel upon lines such as this one, would certainly prefer to pay a little more and get better service.

Self-Injury. This road was already starving to death; the official statement showed it cost ninety-six cents of every dollar taken in merely to run the train, leaving four cents for repairs, interest, maintenance and profit. The land along its lines was only worth a fraction of that bordering along the lines of an up-to-date and thoroughly equipped Rail Road in the same region, though the land itself was probably of just as high a grade.



A POWERFUL ENGINE MADE NECESSARY BY THE VOLUME OF THROUGH TRAFFIC

There is an independent road of the poorest kind in New Jersey, running eleven miles to Morristown. It has but one passenger train, made up of a car and engine. The president of the road, in a public statement made in August, 1910, admitted that the equipment was old-fashioned, dating back half a century or so, but claimed that the engine nevertheless stopped and started very quickly, enabling it to stop between stations to let off and take on passengers.

There are many independent branch lines, but they are often the ones on which a single mixed train is run up in the morning and down at night, and still others where the train goes up one day and back the next. Where these unprofitable lines are owned or controlled by stronger companies they are maintained with a reasonable degree of comfort and efficiency.

The Benefits of Consolidations.

England. In England, where there is absolute control of Rail Roads, they permit consolidation; recently two of the great systems were allowed to consolidate, which brought one-fifth of all the mileage in England under one control.

There is no antagonism, either in theory or in fact, between Steam Road companies and the public, any more than there is between a manufacturing establishment and the farmer who supplies

its men with food, or the grocer or dry goods merchant and his customers. Steam Road companies do not oppress, for the reason that they would, by so doing, inflict as direct an injury upon themselves as upon the public. Rail Roads are prosperous only as the people are prosperous, travel, and have plenty of products to ship.

What Is Gained?

Suppose we sum up the seeming advantages which result from Rail Road consolidation. In the first place, the movement of passengers and freight is expedited by the running of through trains; the comfort of passengers is increased, and their time conserved by the modern dining and sleeping cars, which are made practical by these trains. The modern traveler does not stop to think—in fact, does not know—when his train leaves the tracks of one road for those of another.

Modern Rail Road operation prevents delay; damage to freight through constant handling is lessened in some cases—to say nothing of the expense of transfer, which would be as much as the freight tariff; in case of loss or damage the shipper knows to what company to look for reimbursement, and does not have to ascertain the carrier at fault from among many small companies.

Saving Money.

Concentrated control results in more efficient and economical management. The large, well-managed system has no trouble in financing its loans, and the important factor of interest is lowered. The small company could secure necessary funds only at higher rates, if at all, so that in order to pay this its transportation charges become higher instead of lower.

There are great savings in salaries also, from combinations of Roads. The president, secretary, treasurer, superintendent and many of the other executive officers of the smaller road are eliminated, one man doing the work formerly done by two. Or, in case a larger number of roads are consolidated the same office in half a dozen companies is entrusted to one man, and only one salary is paid.

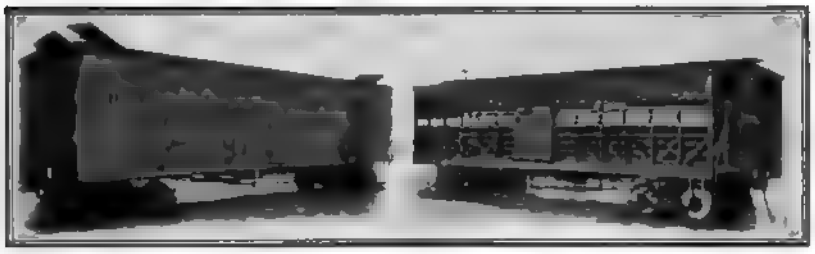
The Problem of Cars.

Another benefit is the more advantageous distribution and utilization of rolling stock. A number of small companies would each have to have enough cars to meet the requirements of the busiest season, with the result that at other seasons many of them would be idle. But the large system can transfer its rolling stock from one section of the country to another, the busy season at one end of its line often being the dull season of the other.

For instance, the fruit and vegetable traffic begins in Florida, moves to Georgia, then to the Carolinas, later to Virginia, then to Delaware and Pennsylvania, and still later to New Jersey.

Enlarging Utility.

Ventilated fruit and vegetable cars belonging to the coast line Rail Roads are used for the benefit of first one section and then the other, as demand for them arises, and the products are ready for shipment.



A REFRIGERATOR CAR AND A LIVE STOCK CAR

It would seem that there need be little fear of any great centralizing consolidation, trust or monopoly of Rail Roads in the United States, as we have too many roads to make this possible.

No Great Monopoly.

There are eight lines between Chicago and Kansas City, five between Chicago and St. Louis, six between Chicago and Cleveland, and nine lines between New York and Chicago, besides five lines, and five new ones building, including Canadian lines, between the Pacific Coast and the East. These show the situation between several of the important points, and serve to illustrate how numerous are our Rail Road lines.

If a great combination ever be formed, and the roads charge enough to become temptingly profitable, new lines will be built by other capitalists and investors, as they have been constructed in the past under similar conditions.

The Gods Will Supply.

With our present system of state and interstate regulation of Rail Roads, however, there would seem to be little fear that whatever consolidation of the various systems may come about, will be inimical to public interest, or result in increased rates to passenger or shipper.

The Introduction of and the Causes Leading Up to Rail Road Consolidation.

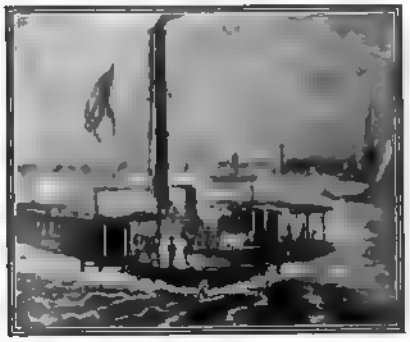
Newton and the Apple.

Just as the trifling incident of a falling apple suggested to Sir Isaac Newton the thought that brought about the discovery of nature's great law of gravitation, so an almost equally trifling incident is said to have led to the application of a plan which was to prove of paramount commercial convenience to the nation.

It is said that years ago a soap manufacturer went to a well-known transportation man in New York City, and told him that he could establish a profitable business in the West if his goods could be gotten to Chicago without the packages being broken and the goods damaged by repeated handling and transshipments.

The Value of Consolidation.

The incident, in a way, seems to have brought to light and to have indicated the value—in fact, the logical and commercial necessity—of physically connected land transportation systems.



THE BROOKLYN FERRY, 1838.

The transportation man to whom this was suggested, was born in 1794, and started his business career with a row-boat ferry between Staten Island and New York City. He quickly realized that human brawn and muscle would not compete with the forces of nature when man had harnessed them, and he invested his savings in a sail boat, and later purchased several sailing vessels.

Wind Versus Steam Power. When man converted the elements of nature into a force still more powerful, reliable and obedient—that is, when steam was applied to the propulsion of boats—he sold his sailing vessels and purchased steamboats. He finally owned a fleet of about fifty of the finest steam vessels of their kind in the world.

He largely dominated the steamboat business upon the Hudson river. A new factor, however, had begun to creep in; keen as his mind was, it took him thirty years after its introduction to realize that the Steam Road was to control

The Daring of an Old Man. But when the mists of doubt rolled away, he sold his splendid steamboats at a sacrifice, as promptly as he had sold his sailing vessels, and he began to invest in land transportation by steam. He is one of the shining examples which aid in the rout of the Oslerian

NEW YORK HARBOR, 1860.

theory, for he was nearly 70 years old before he saw "the new light," and made his great innovation.

The conversion was comparatively sudden. Only seven years before a friend had suggested investing in the Harlem Rail Road, then in the upper part, now in the heart of New York City. The road was suffering from one of its periodical embarrassments, and the old gentleman had said:

"Bring me a steamboat. I won't have anything to do with your ——— Rail Road."

"Not a Chair to Sit In."

At that period most of the Rail Roads of the country were broken down, physically and financially. In 1855 the directors of the Michigan Southern Rail Road had to borrow chairs from an adjoining office to hold a meeting, the sheriff having walked off with their own. Almost all Rail Roads had large floating debts, and when they did pay dividends, it was sometimes with borrowed money, or from capital account.

When this man had changed his opinion of the utility of the Rail Roads, he proceeded to carry out his plans in no half-hearted manner. He aimed to control, not a disconnected Rail Road here and there, the practice up to that time, but a continuous Rail Road —a trunk line—extending from New York to Chicago and the West.

MICHIGAN CENTRAL AT FALLS VIEW. IN 1860 THERE WERE STILL SEVEN DISCONNECTED LINES OF RAILWAY BETWEEN NEW YORK AND CHICAGO.

The Welding of the Links.

Many of the links for this great work were already in existence, and lay disjointed at his feet. Between the '40's and '50's there had been built seventeen roads which served as links, though unwelded, in the chain binding New York and Chicago; eleven of these were between New York and Buffalo.

Marooned.

Up to this time most of the roads were without physical connection, with all the travel and traffic inconveniences already recited.

By 1861, through minor consolidations, the number of independent links in the chain of Rail Roads between New York and Chicago had been reduced to seven. These disjointed lines partly

duplicated the Erie canal, up to that time the most important transportation highway between the East and the West.

Utica to Chicago, 2 Weeks.

In 1842 it took fourteen days to make the journey from Utica to Chicago. Even as late as the '60's it took three times as long by rail as now.

The Rail Roads then were little used as freight highways to the West, the Erie canal doing most of that business. Only human beings were considered fit for Rail Road transportation.

A Comprehensive Plan.

The idea of the man whose story we are recounting was to get control of these scattered roads, his plan or invention being to join them into a continuous line under a single management. By wiping out the time and cost of many transshipments, and by increasing the speed, he planned to take the business of transporting freight away from the highways and canals and transfer it to the Rail Roads.

Backing His Judgment.

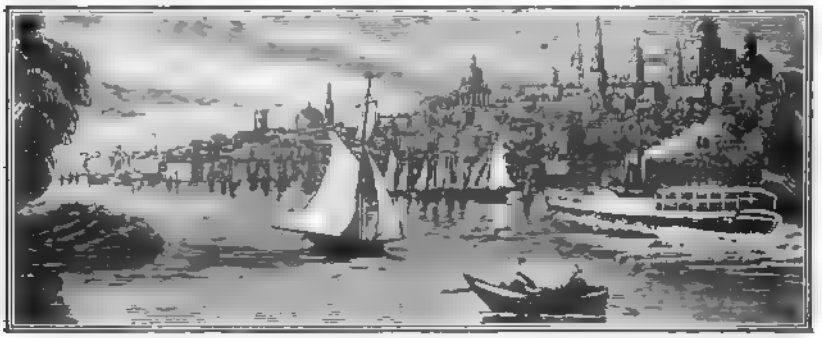
The result of his planning was that this man of 70 cast into the venture, win or lose, the entire fortune and capital which he had built up from a shoe-string.

At the time, every one of these roads was practically bankrupt. As evidence of this, it is pointed out that when our transportation revolutionizer began the purchase of Harlem Rail Road stock, it was selling at eight cents on the dollar; that of the Hudson River Rail Road was going begging at twenty cents.

The panic of 1873, and the bankruptcy of the Lake Shore and Michigan Southern, enabled this man to purchase these roads.

Traveling Over Rough Roads.

That the path of the pioneer Rail Road consolidators was not a smooth one, is evidenced by the experience of Horace Clark, who consolidated the roads between Buffalo and Chicago in 1869. In 1873 those roads had a floating debt of six millions, and an overdue payroll of $1,400,000. They had borrowed two millions from the Union Trust Company, of New York; failure to pay this loan forced the trust company into insolvency



OLD ALBANY, 1840

At this stage of the proceedings the courageous old man whom we are following boldly wrote his check for six millions to pay off the debt, and assumed personal responsibility for the trust company loan, in return taking control of the property himself.

The Profit in Helping Others.

This man's increase in wealth was not made to any appreciable extent from the freight and passenger revenues of his Rail Roads. It came largely because he bought disjointed and broken-down properties and put them together, benefiting because the different links became valuable largely because they had been joined and improved. In the same way a man might buy real estate in bad condition and by improving it and by assisting in the improvements and growth of the town, have his own property greatly enhance in value.

It was about 1867 when the first bridge across the Hudson river was built at Albany; so only 40 years ago was the completion of the link possible. But it was not until 1874, when he was 80 years old, that this man realized his ambition of a New York to Chicago line, which made it possible for the soap manufacturer to load his goods and know that they would not be touched until the car was side-tracked in the Chicago yards.

RECONSTRUCTION OF A RAILWAY BRIDGE.

Multiplying Facilities.

During his control, he not only so improved the road that the people could get over it in reasonable time, but virtually transformed it. He increased the capacity by double-tracking the Hudson River line, and by four-tracking from Albany to Buffalo, two tracks being for freight and two for passengers; it was a big conception, probably the first four-tracked line in the world; even to-day it is one of the few four-tracked lines.

As a matter of fact, the New York Central Lines since the control of the West Shore, are a six-tracked line from New York to Buffalo, probably the longest and most important line of its kind anywhere.

New Lamps for Old.

The forty millions which this man spent on the four-tracking and other improvements, was long the wonder of the Rail Road world. He ripped up the old iron rails, replacing them with steel; wooden bridges he replaced with steel and iron ones, and along the whole length of the line, for the first time, satisfactory freight and passenger stations were built, among them the Grand Central depot in New York, the greatest American terminal of its time. He sank the tracks under Fourth Avenue, in New York City, and altogether showed extraordinary foresight and genius.

Commodore Vanderbilt.

It was largely because of the improvements which this man—Commodore Vanderbilt—made upon these properties, that they became what they did, and of greatly enhanced value to the people of the nation. Was it an undeserved tribute that the "Tribune" paid to him, when it said, years ago:

A Tribute to Enterprise.

"Vanderbilt did more to re-establish confidence in Rail Road management than any living man, which meant the building of more Rail Roads, and did more for the future of the nation, than probably has been accomplished by any single individual"?

Commodore Vanderbilt's methods and practices were probably not commendable in the eyes of all people, for he speculated, and sometimes bagged his rivals when they were laying traps for him. But this was a fashion of the times, and in the end worked out a great public benefit. For every dollar he made for himself out of the first through highway to the West, he made a thousand for the nation.

Economy.

When all this carting, freight handling, shifting, damage to freight by constant handling, time wasted, and what we now look upon as old-fashioned inconveniences, were eliminated, the average charges on handling a ton of freight between New York and Buffalo came down from $40 to less than $4, and the lessening in expense to passengers, including the saving of time and meals, was almost correspondingly as great.

When Vanderbilt began as a steamboat man, the population of the nation was largely confined to the Atlantic seaboard. The great Northwest was still practically a pristine wilderness, and was trodden only by the trapper and the Indian, and the wild animals of the forest and the plains.

Transformation of a Nation.

Chicago, Cleveland, Toledo, Detroit and Buffalo, if shown upon the map, gave little promise of future greatness, and New York City itself had only about 100,000 people. The state of New York consisted mainly of some small towns scattered here and there along the line of the Erie Canal and Hudson River.

What has done most to bring about the transformation which has since been wrought? This story has been told that we may judge for ourselves whether such a consolidation was helpful or harmful to progress and prosperity.

THE ORIENTAL LIMITED CROSSING THE $1,000,000 STONE BRIDGE BETWEEN ST. PAUL AND MINNEAPOLIS.

SECTION XI.

CAPITALIZATION AND OVER-CAPITALIZATION.

Judge for Yourself.

When the question of Steam Roads is discussed one of the first queries in the popular mind is "are they over-capitalized?"

As we explain at the conclusion of this section, we believe that this question and the mooting of it have had a very important bearing on progress and prosperity, and we show how, why and to what extent we should look into it and get the facts, so as to put our minds in a position where each may decide it for himself.

Suppose we decide to determine the value of a piece of real estate, a house, or other property. Would we not probably first seek to ascertain the taxable value as set out in the public tax records, returned by our assessors and appraisers? In setting out to determine the value of Steam Roads, we find that a large number of people, including Uncle Sam's appraisers and the state assessors have covered the ground thoroughly.

Ascertaining Values.

After looking into this phase would we not examine the books of the individual or corporation owning the property, then consider the market value and the returns which the property yields as an investment, and look up all available facts, records and authorities bearing on the subject?

THE CAPITALIZATION OF AMERICAN RAILWAYS IS MUCH LESS PER MILE THAN THAT OF FOREIGN RAILWAYS.

We will proceed along these lines, and see what results are reached under the following analyses:

1. Valuation according to the Interstate Commerce Commission.
2. Valuation for taxation by states.
3. Valuation by the United States government.
4. Valuation according to Poor's Manual.
5. Valuation by experts
6. Valuation by analysis
7. Market value
8. Valuation according to German, French, Belgian and English standards
9. Japanese method.
10. Physical valuation
11. The views of former President Theodore Roosevelt, of Martin A. Knapp, late Chairman of the Interstate Commerce Commission, and of an acknowledged foreign authority on this question.

There is scarcely another industry that affords so many and varied means of checking its value, nor one which offers so many official data.

What Capitalization is. By capitalization is meant capital stock, both common and preferred, and funded debt in the form of mortgage bonds, income bonds, equipment trusts, etc

Many of our Rail Roads hold in their treasuries, as assets, large

blocks of stocks and bonds which they have either purchased or which may represent advances to subsidiary companies, the proceeds of which went into the betterment of the properties.

These are provided, in some cases, to refund at maturity outstanding bonds and notes; or in case other bonds are issued against them they are deposited as collateral.

Valuation by Uncle Sam's Commission.

A Considerable Excess.

In the latest report of the Interstate Commerce Commission, that of 1910, the net capitalization of 235,402 miles of line then reported, is placed at $13,914,302,363; securities owned by the Rail Roads amounting to $3,573,566,572, were deducted by the Commission from the apparent capitalization to find this net.

The cost of road and equipment is given as $13,451,451,401, but this does not include the cost of real estate in states where it is considered as real estate per se, not as part of the Rail Roads, amounting to about $600,000,000. Adding this to the cost of property, we get a grand total of $14,051,451,401. The $137,149,038 excess of value over capitalization represents earnings applied to improvements.

Gross Capital.

According to the reports of the year 1910, the capitalization of the Rail Roads consisted of the capital stock, amounting to $7,686,278,545, and funded debt, consisting of mortgage bonds, $6,942,012,066, and other bonds and obligations amounting to $2,551,709,263.

The gross capital per route mile was $74,289. This is the figure popularly considered as the capital per mile of line. It is, of course, entirely proper to deduct the $3,573,566,572 duplication before referred to, as does the Interstate Commerce Commission, which will cause a reduction to $59,259, in the capitalization per line mile.

Auxiliary Trackage.

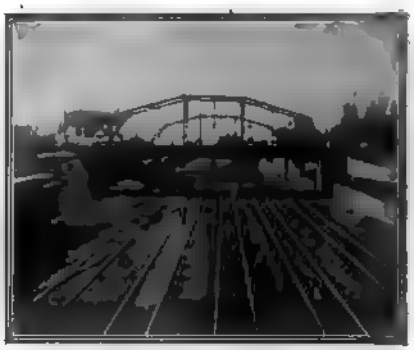
But even this method does not set forth that there were 106,949 additional miles of track, including approximately half a mile of second track, yard, side or other track to every mile of main track. This auxiliary does a large share of the Rail Road's work and is sometimes so important that on a double-tracked road, for instance,

Railway Yard at Roosevelt, L. I.

St. Louis Yards, Mill Creek Valley

STEAM SHOVEL ENLARGING SIDING SPACE TAYLOR YARDS.

ELIMINATION OF GRADE CROSSING, SHOWING SEVEN TRACKS, JAMAICA, L. I.



where each track is equally used, one cannot determine which is the main and which the second track.

Value is Value. There seems no reason why every mile of track should not be called a mile of track, and counted as an asset and part of the Rail Road. Otherwise might we not just as well figure the value of a farm upon the land alone, and give no value to the houses, barns, implements, stock, fences, etc. without which it would be of little practical use, and all of which are necessary to make it an active working proposition?

Sometimes the improvements and equipment of a farm are worth more than the land itself; might we not say appropriately, on the same basis of reasoning, that a man has only a hundred acres of land, because he only planted 100 acres of wheat, and used fifty other acres for grazing, orchard or timber? The assessor, at least, requires taxes to be paid on the total.

Only Smaller Wheels. These auxiliary tracks are absolutely essential to the handling and transportation of our goods, and to the operation of our Rail Road system, as much as horses and plows are necessary on a farm.

When we divide the net capitalization by our total actual miles of Road, we find that the Rail Roads are capitalized at $40,643 per mile. In round numbers this is $7,000 per mile less than the cost of a Rail Way as shown in our "Analysis."

Valuation by Analysis.

Piece by Piece. Our chapter, "The Analysis of a Rail Road," gives the cost of every detail going into the construction and equipment of the average Rail Road. The figures amount to about $47,000 per mile. On this basis, the cost of the 342,351 miles of track in the United States on June 30th, 1909, was $16,090,497,000, approximately $2,378,629,266 in excess of the net capitalization.

Valuation for Taxation by the States.

Few realize that Uncle Sam maintains a large and accurately kept set of books, periodically balances them, enumerates his property and counts his assets; his latest appraisal having been made in 1904.

The Nation's Values.

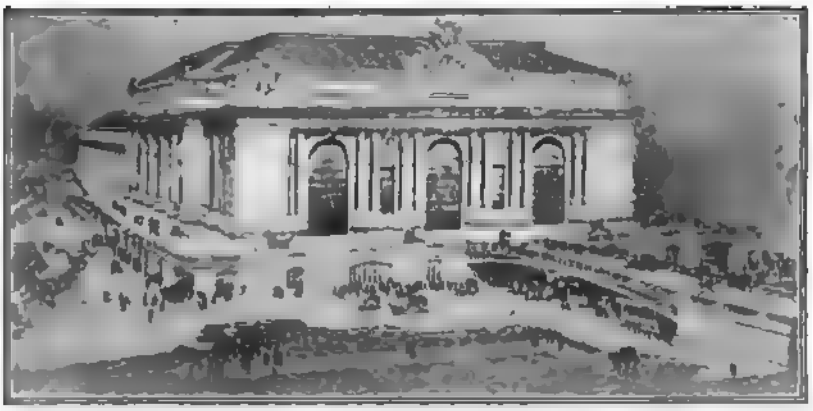
The total valuation of all property in the United States, according to Uncle Sam's balance sheet as struck in 1904, was more than $107,000,000,000, of which 10.5 per cent, $11,244,753,000, was credited to and given as the value of Rail Road property.

The same year property was assessed for taxation by the various states at an average of 35½ per cent of the true valuation, or $38,963,381,120. Assuming that the taxation of Rail Road property was at the same ratio as other property, the assessed valuation of Rail Roads was $4,091,155,018, and the amount of taxes paid by the Rail Roads, $63,324,551, was at the rate of 154 4-5 cents on the hundred dollars of that amount.

The Rail Roads paid taxes of $90,333,559 for the year ending June 30th, 1909. At 154 4-5 cents on the hundred dollars, their actual valuation at the same ratio would be $16,438,033,000.

Real Estate Excluded.

Neither of these figures, however, included the vast and valuable property which in the States of New York and New Jersey is taxed separately as real estate. The New York Central pays about $3,000,000 for taxes on real estate alone, out of a total of about $4,500,000. This real estate amounts to about $370,000,000 in New York and to $230,000,000 in New Jersey, thus making the total valuation for the year ending June 3rd, 1909, $17,038,000,000.



THE NEW GRAND CENTRAL STATION, NEW YORK

A Large Surplus.

Thus the actual valuation of American Rail Roads by the state assessors is greater than their net capitalization of $13,914,302,363 by $3,124,000,000, or about 22 per cent, an excess amounting to more than the circulating medium in the United States.

Valuation by United States Census Bureau.

In the reports of the census bureau of the Department of Commerce and Labor of the property values of the United States for

1904, $11,244,852,000 is given as the cost of our Rail Roads, an amount considerably greater than their net capitalization at that time.

Another Method.

It has been estimated that an average of $500,000,000 of new money is put into the Rail Road industry yearly. Therefore the valuation for 1909 would be $2,500,000,000 more than for 1904, or approximately $13,750,000,000. Including $179,423,000 put back into the property from income during the same period, there is an excess of value over the 1909 capitalization reported by the Interstate Commerce Commission of about $15,000,000.

Valuation According to Poor's Manual of Rail Roads.

Interesting Figures.

According to Poor's Manual for 1910, which gives the figures for the year 1909, the capitalization of the 236,377 route miles of Rail Road completed at the end of that year, was $17,942,282,575, but of this amount the Rail Roads held in their treasuries or had deposits in trust of $3,084,387,008, leaving an actual outstanding capitalization of $14,857,895,567 to represent investments of $14,514,822,308 for road and equipment, and $907,873,063 for real estate and other investments.

The Gain of the Roads.

In other words, the permanent investments of the Rail Roads total $564,799,864 in excess of their capitalization, the excess representing earnings put back into the properties.

BEFORE TRACK DEPRESSION.

AFTER TRACK DEPRESSION, SUMMIT, N. J

The Valuation by Experts.

Method.

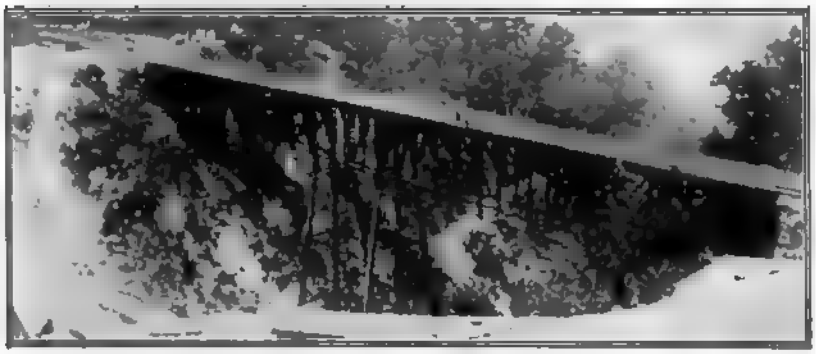
Professors Adams and Meyers, the official experts of the Interstate Commerce Commission, computed the value of the Rail Roads of the United States several years ago, basing their estimate on the average earnings after deducting operating and other expenses for a series of years and capitalizing the result on the basis of what they considered the average return for capital, at 4¼ per cent—to be exact, 4.256 per cent.

According to their method Rail Roads and Rail Way property to-day would be worth approximately $14,500,000,000.

An Omission.

The estimates of these experts, however, would appear to be too low, judging from the fact that they allowed an increase in rolling stock for a whole year of only about $6,000,000. During that year there was a net gain of 1,614 locomotives, 961 passenger cars and almost 40,000 freight cars.

The aggregate expense for such an increase cannot be less than $70,000,000, which does not take into account the cost of replacing thousands of locomotives and cars discarded and destroyed.



FILLING IN VIADUCT, WEST OF DANSVILLE.

Equipment of Billions.

For 1907, it was reported that there were 58,301 locomotives, costing $696,612,000; 47,273 passenger and miscellaneous cars, costing $236,365,000, and no less than 2,084,214 freight cars, costing $1,667,371,200, the whole representing an investment of $2,600,348,200.

During the seven years from 1899 to 1906, it is estimated that the Rail Roads spent $1,346,000,000 for new equipment, or the equivalent of nearly $7,500 a mile for this item alone. This is nearly one and a half times our interest-bearing national debt.

Market Value.

What is Bid.

The most severe test, probably, of the value of any piece of property, is what it can be sold for at auction or what people are willing to pay for it. Let us see how our Rail Roads stand this test.

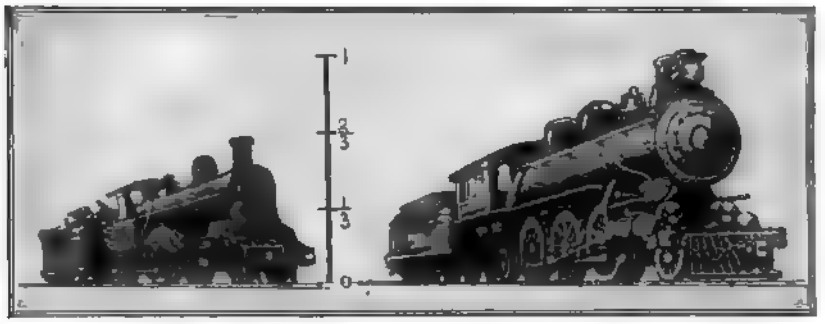
In 1900, the market value of our Rail Roads was about 96 per cent of their net capitalization, or $9,163,170,382; by 1905, the net capitalization had risen to $11,167,000,000, and by 1907 to $13,054,000,000.

Considerable Fluctuation.

On the 96 per cent basis, the market value would have been $10,720,000,000 in 1905, but between 1900 and 1905, the securities advanced an average of 20 per cent, so that the market value of the Rail Roads in the latter year was about $13,000,000,000. As our stocks

are held and sold in many parts of the earth, this may be said to be the world's consensus of opinion regarding the value of our Rail Roads, backed by its willingness to buy at these prices.

In 1907, market prices fell off about $2,000,000,000, although the Rail Roads had more money invested in them, were in better physical condition than ever before in their history, and were taxed to their utmost capacity by the enormous traffic. Consequently their market value in that year would have been probably $12,315,000,000. Their market value was computed at $17,000,000,000 in July, 1909. At that time it was, therefore, some $3,000,000,000 in excess of the total capitalization.



RELATIVE MILEAGE OF THE RAILROADS OF EUROPE AND THE UNITED STATES.

German, French, Belgian and English Standards.

Eastward Ho! It is interesting to look a little further afield, and compare the capitalization of our Rail Roads with that of some of the well-known nations of the earth.

In Europe labor, one of the principal items in the construction of a Rail Road, requires less money expenditure than here. Although the physical constituents of the Roads are no more expensive, the ballast and grading of European Rail Roads are probably cheaper than ours, because of the lower labor cost; the only item which suggests itself as possibly more expensive is the minor one of ties. Yet, the additional cost of these is comparatively trifling, for it cannot be more than a thousand or twelve hundred dollars a mile over our cost. The figures given here compare our capitalization with that of foreign Steam Roads.

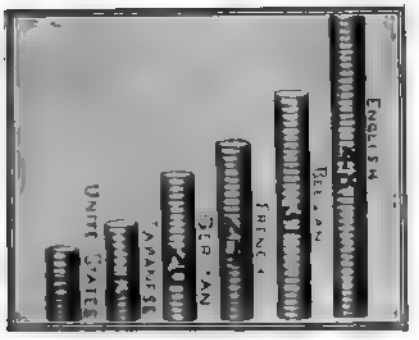
European vs. American. If our Rail Roads were valued at the average per mile at which German roads are capitalized, they would be capitalized for no less than $25,000,000,000 or there would be $999 extra on each thousand of our present net capitalization; upon the French basis, they would be valued at $32,536,000,000 or $2,437 for each thousand dollars of our present net capitalization; upon the Belgian basis, at $41,496,000,000, about $3,105 for each thousand of our net capitalization; upon the English basis, at $64,273,000,000, or practically $4,824 for each thousand dollars of our net capitalization.

English Right of Way.

These large differences are interesting, but it is difficult to determine from what the great cost of foreign Rail Ways arises. The right of way presents the only feature of greater cost in England than in the United States. If we allow this to be as much as 11 times as large as we estimate ours, or the enormous sum of $100,000 a mile greater there than here, it would certainly seem more than ample. While the values of English land, since the institution of the Rail Roads, never averaged so low as in the United States, they certainly were much less at the beginning of the Rail Road era than now.

It is Still Double.

But even this liberal estimate of $100,000 does not begin to explain away the difference in cost between John Bull's roads and those of Uncle Sam, for it still would allow ours to have a capital of $40,000,000,000, an amount twice as much as the full face value of our Rail Road stocks and bonds, with 50 per cent added. Even with this heavy arbitrary deduction, our Rail Roads could still have a capital of $3,000 for each thousand dollars at present.



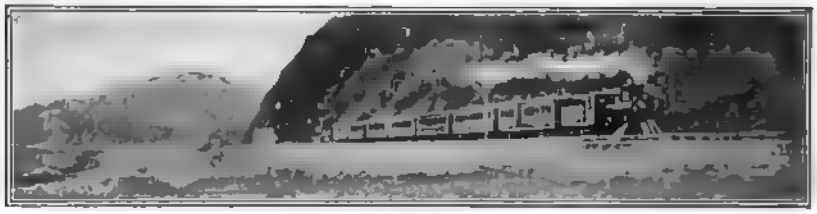
PROPORTIONATE CAPITAL PER MILE OF LINE IN VARIOUS COUNTRIES.

The Japanese Government Appraisal.

Japan, since 1904, has taken over most of her Rail Roads, previously privately owned. The valuation of the Roads by the Japanese government experts would seem to furnish us with an excellent example of official valuation. It is probably the latest example of the physical valuation of Rail Roads by a national government and is especially valuable because of the purpose for which it was made.

The Last Proof.

The figures were subsequently made official and confirmed by the purchase of the property by Japan at the prices given below. Since few people have shown themselves more shrewd than the Japanese, we may well take it for granted that the valuation having been made for the state was on a sound commercial and financial basis.



THE TOKAIDO EXPRESS, JAPAN.

In considering the appraisals it should be remembered that the Japanese Rail Roads were built by labor costing probably not more than one-tenth of that in the United States; that the lines are much lighter in construction, and their equipment far less abundant and costly. They are largely passenger lines, carrying only a comparatively small tonnage of heavy freight, and consequently have little rolling stock comparing with our modern freight cars, which alone represent an investment of from $1,500,000,000 to $2,000,000,000.

The Japanese Formula.

The Japanese method of valuing these Rail Roads for purchase and acquirement, was by multiplying the average net profits of three years by twenty, dividing the product by the cost of construction, and multiplying the quotient by the paid-up capital. Figured out on this basis, the value of American Rail Roads would be approximately $17,900,000,000, or $1,330 for every $1,000 of the estimated net capitalization of our Rail Roads to-day.

Physical Valuation.

Unexpected Results.

Much has been said of the desirability of physical valuation of Rail Roads. The states of Wisconsin, Minnesota, and Washington have made such valuations, with the result that these gave figures greatly in excess of capitalization.

Wisconsin's 7,135 miles were capitalized for $33,424 per mile in 1906, physical valuation declared them to be worth $34,630. The average capital of Minnesota's 7,596 miles was $44,206, although the valuation by the state declared them to be worth $54,201.

The valuation in Washington was $29,000 and $36,000 per mile, respectively, above the capitalization of two roads thus valued. In the case of only one road was the capital found to be more than the figures of the physical valuation—this instance giving $4,000 more, but this was for a road of 500 miles, out of a total of almost 17,000 miles in these three states.

A New View.

Senator Albert B. Cummins, formerly a leader in the physical valuation movement of Iowa, said in February, 1910, in a speech at Chicago, that he would not be willing to make a present valuation of Rail Road property a basis for determining rates, "for the reason that it was more than probable that the present capitalization of between fifteen and sixteen billions would be increased to twenty billions."

The appraisal given above was in the newer states, where values

of real estate, terminals and right of way have not had nearly the chance to increase as those in the older sections.

Needless Alarm.

On the basis of the physical valuation so far made, it would appear that the owners of Rail Roads need have no fear that such valuation of their properties will give sums less than their capitalization, or that rates based on such figures will be lower than those now ruling.

The men who made the valuations in Wisconsin, Washington and Minnesota, were employed by the states themselves, and, it is safe to say, were not predisposed to find higher values than existed. Yet, they showed an average of $8,281 per mile more than the face of all the securities of the properties they examined. This addition would make our average net capital per line mile, $65,482, which would give an additional two billions, or to be exact, $1,935,079,237 for the entire mileage of the country, above our net capitalization.

Opinions of Note.

What Might Be.

Judging by the best and most authentic standards to be found at home and abroad, as given above, the value of our Steam Roads seems not only to represent their capitalization dollar for dollar, but as though it might still be increased hundreds and hundreds of millions without reaching the actual value of the property it represents.

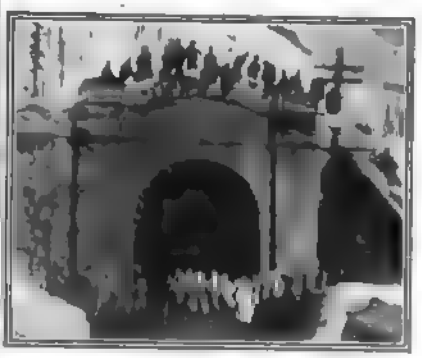
In this connection, the following expressions are of interest:

Theodore Roosevelt.

When Theodore Roosevelt was president he said in a Decoration Day address at Indianapolis: "There has been much wild talk as to the extent of the over-capitalization of our Rail Roads. The census reports on the commercial value of the Rail Roads of the country, together with the reports made to the Interstate Commerce Commission by the Rail Roads on their cost of construction, tend to show that, as a whole, the Rail Road property of the country is worth as much as the securities representing it, and that in the consensus of opinion of investors, the total value of stock and bonds

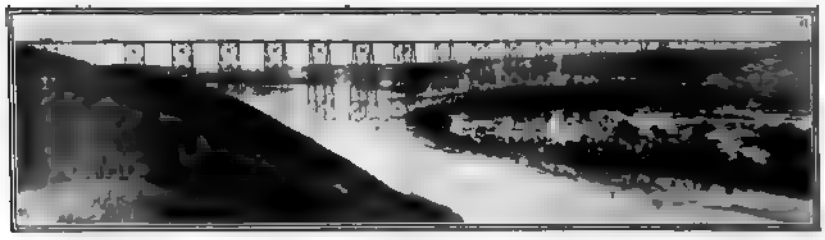
Interior Pennsylvania Station, New York

Portal Cascade Tunnel.



is greater than their total face value, notwithstanding the water that has been injected in particular places.

"The huge value of terminals, the immense expenditures in recent years in double-tracking and improving grades, road beds and structures, have brought the total investments to a point where the opinion that the real value is greater than the face value is probably true."



AN IMPORTANT AND EXPENSIVE RAIL ROAD VIADUCT.

Chairman M. A. Knapp.

Martin A. Knapp, late chairman of the Interstate Commerce Commission, in "Annals of the American Academy of Political and Social Science," July, 1908, says:

"Without regard to the personnel of Rail Road officials, without regard primarily to the interest of stockholders, but in the interest of public welfare and national prosperity, we must permit Rail Way earnings to be adequate for Rail Road improvement at advantage and profit.

The Need for More Facilities.

"To my mind it is a most imperative fact, so great as to elude the grasp of imagination, that the Rail Way traffic of the country fully doubled in the first seven years of this twentieth century.

"This enormous addition to the volume of transportable goods overtaxed, as you know, the existing facilities, and the resulting condition perhaps accounts for much of the hostility which has been manifested in various quarters. For the man who has raised something by hard labor or made something with painstaking skill, which he could sell at a handsome profit in an eager market, and finds that he cannot get it carried to destination, and so sees his anticipated gains turned into a positive loss, is naturally exasperated and unthinkingly blames it on the Rail Roads, and is ready to hit them with anything he can lay his hands to; and as the state legislature seemed to be the most convenient weapon he wielded it for all it was worth.

The Case in a Nutshell.

"I dwell upon this a moment further, because it seems plain to me that the prosperity of the country is measured and will be measured by the ability of its Rail Roads and water ways to transport its increasing commerce.

"With a country of such vast extent and limitless resources, with the means of production developed to a wonderful state of

efficiency, the continued advancement of this great people depends primarily upon such an increase of transportation facilities as will provide prompt and safe movement everywhere from producer to consumer; and that we shall not secure unless the men who are relied upon to manage these great highways of commerce have fitting opportunity, and the capital which is required for their needful expansion is permitted to realize fairly liberal returns."

British Confidence.

The London Statist, of August 24, 1907, speaking of American Rail Ways, says: "The amount of profit diverted to capital purposes in recent years has been on a truly colossal scale."

White Face Cattle, Wyoming.

THE ABSENCE OF OVER-CAPITALIZATION.

Some consider that the valuation of our Rail Roads should be purely on the basis of what has been put into them; that every dollar which cannot be traced must represent fictitious value. Would it not be well to remember that our Rail Roads have kept pace with every other class of property in growth of values since their inception and construction?

Marvelous Multiplication.

President Jefferson made the Louisiana Purchase in 1803, whereby the nation acquired for $15,750,000 a territory that in wealth and population is today as important as many empires. It embraces the states of Louisiana, Arkansas, Missouri, Oklahoma, Iowa, Nebraska, and South Dakota, and large parts of Minnesota, North Dakota, Wyoming, Colorado, Montana and Kansas. To-day the government valuation of the Louisiana Purchase is fully $25,000,000,000, constituting a fifth of the assets of the country, and 1,667 times the cost of the territory.

How Things Increased.

It has increased in value to the amount of its purchase price approximately every twenty-three days It is probable that nine-tenths of this increased value is the growth of the past 40 years, that is, since the first extensions of the Steam Road into and through the territory, and, coincident therewith, the development of natural resources. It may be said, in fact, that during that 40-year period the increased value of this territory has given the nation 100 per cent in profits every nine and three-quarter days. Assessed prop-

erty values in New York State have increased over 100 per cent in the last ten years, and in New York City 122 per cent.

Equally stupendous increases in property values in many cases, following the construction of Railed Roads, have gone on in every other nook and corner of the land.

Share and Share Alike.

It is difficult to find the reason why property and investment in transportation should not have participated in the increase, especially as such general appreciation was often created by the introduction of transportation.

It is true that much of the stock of our early Rail Roads was given without money being paid for it; true that it was sometimes not even given in payment for the material which went into the roads. But, on the other hand, it was paid for something, namely, creative and constructive enterprise.

Enterprise.

Only one school of economy denies the value of individual enterprise—that of socialism. Enterprise—call it daring, pluck, bravery, initiative, what you like—is the quality which builds cities on the prairies, produces prosperity from the wilderness, and makes progress in the deserts.

SEATTLE, 1878

Since the value of enterprise and initiative has always been recognized, it seems fair to pay for them. And if the payment for enterprise was made with a medium of uncertain value, did not "water" pay for blood, for brain and effort?

It has been America's willingness to pay for such things that has made the nation great and has encouraged men to do and dare, just as the hopes of profit have encouraged invention.

Rewarding Conception.

We, in America, acknowledge the spirit and pay for the brains which create new ideas. We show our appreciation of their value by providing for a seventeen-year protection for inventions by patent.

It would seem that those who conceived the idea of carrying transportation into new places, joining isolated sections of the country, making raw material valuable by means of having it brought to the factory and creating a new and prolific source of supplies, are entitled to something for their conception and for carrying it out.

If their reward therefor be called water, why should not the profit of the inventor, derived with the help of the protection of the patent, be given the same name?

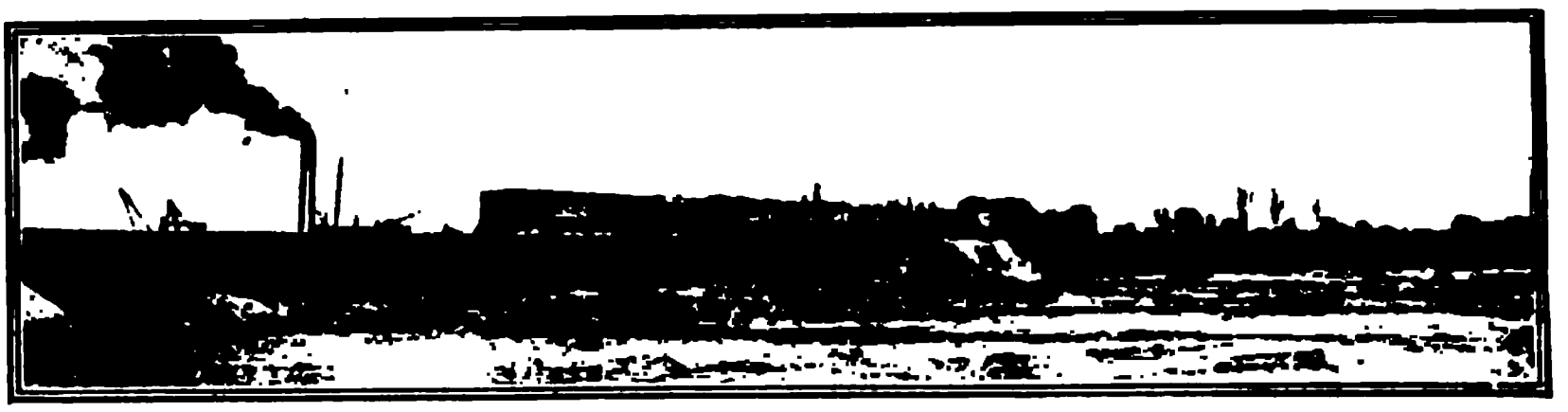
The Total. In round numbers, our Rail Roads are capitalized at $38,000 for each mile of track, about $7.25 per running foot. The figure includes cost of right of way, fencing, grading, cut, fill, ballast, ties, tracks, stations and terminals, machine shops, round and freight houses, boats, equipment for maintenance and repair, the rolling stock of the Rail Roads, tunnels and bridges, and all the other appurtenances which go to make the Rail Road a working whole.

FILL ON WISCONSIN CENTRAL, WHITE RIVER. HOW A R R CROSSES A RAVINE

In view of the reports of the state engineers of New York, Pennsylvania and Rhode Island, that it costs about $10,000 a mile merely to regrade, drain and macadamize an already existing highway, with but 12 and 14 feet of wearing width, the cost of Steam Roads hardly seems excessive.

Rail Road Essentials. In the case of rebuilding a highway, there is usually no right of way to purchase; there are no wood and iron ways to lay, there are no elaborate stations nor terminals to provide, no steam horses and cars to furnish, no tunnels to bore, no bridges capable of bearing millions of pounds of weight to be built, and there is no forcing down to a one per cent or a half of one per cent grade, nor no long curves and deep fills. In fact, the material used on the modern highway represents little more than the stone and gravel of the Rail Road, carefully rolled and rammed down.

Our "Analysis of a Rail Road" shows how numerous are the



FILLING A GAP OVER WATER.

items in the construction of a Rail Road, which are not necessary in the construction of an ordinary road or highway.

Other Sinkholes.

Losses Not Capitalized. Not one of the many methods by which the capital and the value are compared, takes into account the vast sums put into Rail Roads which have been wiped out and lost to the investor through foreclosure of mortgages, or the sale of Rail Roads far below their cost in the case of unprofitable properties.

In a measure the immensity of such losses may be realized when it is understood that $3,000,000,000 have been lost through receiverships of Rail Roads which were built in territories that failed to become profitable rapidly enough to save the investor.

These sums went into the Rail Roads, but many of them have not been repaid, and should still stand on the balance sheet as a part of the cost of our great land transportation system as a whole.

Assessments. Further, millions in assessments have been levied upon stock and bondholders, when it became necessary to secure additional capital for the rehabilitation of roads at critical periods of their existence, as in the notable case of the Baltimore & Ohio.

In many instances, unfortunately, the results were not so successful as in this case. Often assessments were levied without new securities being issued for them, the sums being paid by the stockholders simply for the privilege of keeping what they had.

Uncapitalized Improvements. The Interstate Commerce Commission in its last report states that in the year 1908, $680,000,000 were taken out of earnings and put back into the Rail Roads for improvements and repairs. Kept up for 10 years, this would put back into the properties a total almost equal to the entire capital stock.

Just as farmers invest part of their earnings in live stock, barns, implements, and tools so the Rail Roads from their earnings have added gradually to their property from year to year. It would be difficult to find a Rail Road that has not improved its property through such means, if it has ever made anything above its interest and cost of operation. As this has been going on for practically eighty years, to a greater or less degree, it is apparent that many hundred millions of dollars must have been put back into the Rail Roads.

Conservatism of Management.

A retired Rail Road president, giving some reminiscences of his experience, told the writer how, when the road was earning 13 per cent, he had to struggle with his directors to keep them from paying more than 4 per cent in dividends; when it was earning 18 per cent he permitted them to increase the dividend only to 6 per cent.

Every dollar of the rest was put back into the line, which needed it sorely, as it was then in progress of transformation from an old-time Rail Road to a modern business enterprise. The rehabilitation of this road meant not only the restoration of the road itself, but also the commercial rebuilding of a large section of the country which had been prostrated by the Civil War.

Common Practice.

Every dollar invested in this Rail Road has added several dollars to the value of the land or property along its lines. This road has never paid more than 6 per cent, and for every dollar in dividend has put one or more back into the property from earnings.

This is only an instance of what has been done to a lesser or greater degree on many Rail Roads in the United States. For many years in many cases every cent in excess of operating expenses and interest has been put back, and the stockholders got nothing.

The New York Central.

The capital stock of the New York Central, including all proprietary lines, amounts to $409,046,645; the funded debt to $534,068,672. It is safe to say that these roads cannot be duplicated to-day for 50 per cent above their total capital. In fact, W. C. Brown, President of the New York Central Lines, recently testified before the Interstate Commerce Commission that they could not be duplicated for twice their present capitalization.

During the past 20 years they have paid an average annual dividend of only 3.9 per cent on the stock. During the time that such returns were made to the owners, the management took out of receipts and put back into the properties for the benefit and convenience of the public $145,700,000, no less than 35 per cent of the face of the capital stock, for which not a single dollar of new securities was issued.

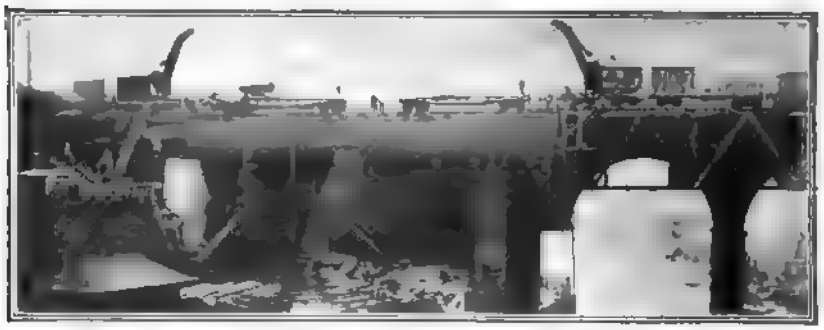
THE THIRD GRAND CENTRAL STATION, NEW YORK, AND ITS DEMOLITION

Sinking Funds. Through the medium of sinking funds, hundreds of millions of dollars of the amounts invested in our Rail Roads have been repaid, and do not appear as indebtedness. The sums applied to the betterment of Rail Roads, without being added to capitalization, amount to a tremendous figure, and wipe off the books much of the money that has gone into our Steam Roads from the sale of bonds.

According to some, no further proof is needed that water has been injected into our roads than that the face value of some of their securities is greater than the actual amount received for them.

Government Watering. If this contention be true, the national government must have watered its securities, when, during the civil war, a 5 per cent bond was sold for 75 cents on the dollar. The national currency also must have been watered, for at one time $2.64 in greenbacks were required to purchase one dollar in gold.

Sold at a Premium The other side of the question—selling stocks and bonds at a premium—is infrequently referred to, although in this country such sales are common enough.



BRIDGE RECONSTRUCTION—PUTTING A STRONG BRIDGE IN PLACE OF A WEAK ONE, AND MAINTAINING TRAFFIC MEANTIME

The city of New York has sold issues of bonds and corporate stock at a premium; so have other municipalities, a number of states and the nation at large. A number of our Rail Roads during the past few years have sold $100 shares of stock for $110, $115 or $125, and this money was used to enhance the value of the roads and incidentally benefited the territory served by them.

Balancing. These bonuses or premiums, over and above the par value of the stock, have amounted to millions. In the case of the Pennsylvania Rail Road the premiums at which stocks have been sold equal, if they do not surpass, the totals of the discounts of the securities sold below par, or any which may have been issued to the men who did the work and took the risks of building the roads.

There seems to be a deep-rooted impression that Rail Way rates are kept unwarrantably high in order that dividends may be paid upon fictitious capitalization. According to this principle the roads with the least capitalization should be able to carry goods at the lowest rates.

Least Capitalization.

But as a matter of fact the one with the least capitalization is frequently in the worst condition, gives the poorest service, has to charge the highest rates, and makes the least or nothing at all.

In the aggregate, the freight and passenger service on Steam Roads represented by 36 per cent of the total, is performed for the public without profit to the stockholders of the roads.

Steam Roads with widely different capitalizations charge like rates for the same service. Usually charges differ only because of differences in speed or time, the natural obstacles to be overcome or some other physical influence. In fact, it may safely be said that the capitalization of trunk lines is the highest and their rates the lowest.

If one wants to ship on a Rail Road paying no dividends, thinking that he thereby may save on transportation bills, he can find some such Rail Road in almost any section of the United States. But he will soon discover that the fact of non-dividend payment does not make the rate any less, nor does it enable the road to carry passengers or freight for less.

The Effect of Competition.

It goes without saying that any business peculiarly profitable or attractive for any length of time invites and sooner or later must meet with competition, the instinctive application of business rivalry.

It is but natural that when the earnings of a particular line are higher than a fair profit on the expenditures for operation and construction warrant, and rates are higher than allowed by market conditions, some enterprising individual will quickly perceive a field for active competition.

Why Little Paralleling.

As an evidence of the fact that there have been no undue profits, it is well to note that for a number of years there has been little paralleling of Rail Roads between important points, unless such roads were to connect existing lines in the hands of the same interests. Therefore, to secure the lowest rates, it only is necessary to keep the field open to all, and thus, even without Rail Road commissions, self-preservation would seem a factor which will prevent excessive charges.

The agitation of the question, which resulted in such general distrust of capital and everything in which it is interested, caused a shrinkage of substantially $5,000,000,000 in the market value of our securities in 1907. It is safe to say that it caused also a 5 to 10 per cent temporary shrinkage in the immediate sale value of farm, mineral and timber lands, city real estate and almost every other kind of property in the United States.

Your Loss and Mine.

The loss of confidence, the hoarding of money and the contraction of credit which resulted subtracted for the time being probably $10 from every $100 of all values in the United States.

It is this hoarding of money by the general public which is so disastrous to the extension of our Steam Roads. If the always necessary additions are to be made, the money for them has to come from the public at large, notwithstanding a certain hazy belief giving the derivation of money for public means of transportation to some mysterious and magic source.

There was a period of popular misunderstanding when the wage-earner was inclined to laugh at the losses of capital. But as a matter of fact the person who suffered most from such losses, because he is least able to bear the resultant reduction, has been the wage-earner, labor's lessened volume of employment, together with wage reductions, according to the eminent labor leader, Mr. Samuel Gompers, amounting to almost 50 per cent of the total during the late panic.

Unity of Interest.

The unity of interest of the whole nation is thereby shown, and the fact that the loss of one, from such conditions, injures all.

Hence, the importance to each of us of getting at the facts rather than accepting undergrounded assertion for investigation of this important question and its bearing on progress and prosperity.

A CAPITALIZATION OF THE TOTAL DIVIDENDS PAID.

Interesting Facts on the Question of Overcapitalization.

Of Real Importance.

While it appears to be a fact, proved in many official ways that our Rail Roads are not overcapitalized, the nominal capital stock of our Rail Roads does not mean much to the shipper, although the amount on which dividends could have been paid may be of importance to him. As many laymen believe that rates are unduly high, merely to

enable the payment of large dividends, let us see on what amount of capital stock dividends have been paid in the twenty-six years ending with 1907.

Below we capitalize the actual Rail Road dividends paid, at an average of five per cent for each of our groups of states.

The Pacific Group of States.

Small Capital Represented.

In this group, in the year 1894, the aggregate dividend for the year per mile of road was $3.33, which capitalized at five per cent, amounted to only $66 per mile. In the best year, 1907, the roads paid the equivalent of five per cent on $18,364 per mile; for the five years ending with 1898, the average was five per cent on $630 per mile, and for the ten years ending with 1903, it was five per cent on $992 per mile. For the twenty-six years ending with 1907, the average paid, $244.63 per year, capitalized at 5 per cent, represented $4,892 per mile of steam road.

Southwestern Group.

A Low Maximum.

In 1896, the year of the lowest dividend, shippers and consumers contributed in the form of dividends $19.27, sufficient to pay a five per cent dividend on a capitalization of only $385 a mile. In 1907, the best year, the total dividends were equal to five per cent on $10,440 per mile.

For the five years ending in 1896, the roads in this section paid dividends aggregating $35.49 per year, which, capitalized at five per cent, amounted to $709 per mile. For the ten years ending with 1899, the average dividend would have paid five per cent on $1,211. The average for the twenty-six years ending with 1907, was $247.82 per annum, equivalent to five per cent on $4,956 per mile.

The New England Group.

The Best Not Very Good.

In the New England group's best year, 1907, dividends were $1,489.43, equal to five per cent on $29,788 per mile. For the five years ending with 1886, the average was $983.41 per annum, or five per cent on $19,668. For the ten years ending with 1891, the gross dividend averaged $1,005.58 per year, or the equivalent of five per cent was paid on a capital stock of $20,111. The average for the twenty-six years ending with 1907, was $1,150.72, the equivalent of five per cent on $23,114 per mile.

Gulf and Mississippi Group.

The lowest capital on which dividends were paid in this group of states was in 1894, when the stock received $39.87, only equal to 5 per cent on $797 per mile. The dividends were at their highest in 1905, when they amounted to $345.54 for a twelvemonth, or five per cent on $6,910 of stock. The average return for the five years ending with 1887 was $60.17 per annum or five per cent on $1,203.

South Atlantic Group.

A Fraction of Real Capital.

The dividends were at their lowest in 1894, when they amounted to $71.21 for the entire year, equal to five per cent on $1,424 per mile of track. They were at their highest in 1906, $346.24, when they represented five per cent on $6,924. For the five years ending with 1898, the dividends averaged $97.16 per annum, or five per cent on $1,943, while for the ten years ending with 1898, they were $131.20 per year, equal to five per cent on a capitalization of $2,624 per mile. The dividends for the twenty-six years ending with 1907, averaged $217.77 per annum per unit, sufficient to pay five per cent on only $4,355 per mile.

Middle Group.

A Return on $30,000.

In this group the highest dividends were paid in 1907, when $1,493.57 was divided among the stockholders of each mile of road; at 5 per cent it paid dividends on $29,871. For the five years ending with 1899, there was an average of $778.49, the equivalent of five per cent on $15,569, while for the ten years ending with 1899 the dividend averaged $843.56, equal to five per cent on $16,871. The average return for twenty years ending with 1899, was equal to five per cent on $20,781 per mile.

Central Northern Group.

Average of $10,000.

The dividends for the year 1897, capitalized at 5 per cent, amounted to $7,553 per mile; they were $715.68, 5 per cent on $14,313, in 1882.

The average for the five years ending with 1898 was $398.53, the equivalent of five per cent on $7,970, and for the ten years ending with 1898, $418.87, five per cent on $8,377. The average for the twenty-six years ending with 1907, would have paid a five per cent dividend on $10,421 per mile of track.

Northwestern Group.

Dividends were at their lowest in this section in 1889, when they were $87.18, which would have paid five per cent on only $1,743 per mile; the largest dividends were paid in 1906, when they amounted to $1,462.08, five per cent on $29,241. The average for the five years ending with 1890 was $133.76, five per cent on $2,675 per mile; for the ten years ending with 1895, the equivalent of five per cent on $13,244 was paid. The dividends paid for the twenty-six years ending with 1907 averaged five per cent on $11,981 per mile.

The United States.

Disappointing Results.

Capitalizing the dividends paid on the Rail Roads of the United States at 5 per cent in the year of the highest average, 1907, brings the amount to $17,155.

The average for the five years ending with 1896 was five per cent on only $7,091 per mile, while the average for the ten years ending with 1898 was 5 per cent on but $7,592. The average for twenty-six years ending with 1907 was 5 per cent on $10,439.

A SUMMARY IN TABULAR FORM OF THE CAPITALIZATION OF THE ACTUAL RAIL ROAD DIVIDENDS PAID ON A FIVE-PER-CENT BASIS.

For the United States and the Several Groups of States.

The following are the amounts per mile of line on which the people or shippers paid dividends as above:

Pacific Group of States.

	Dividends paid capitalized on a 5-per-cent basis per mile of line.
In 1894—Lowest	$66
In 1907—Highest	18,364
Five years ending with 1898—Average	630
Ten years ending with 1903—Average	992
Twenty-six years ending with 1907—Average	4,892

Southwestern Group.

In 1896—Lowest	$385
In 1907—Highest	10,440
Five years ending with 1896—Average	709
Ten years ending with 1899—Average	1,211
Twenty-six years ending with 1907—Average	4,956

New England Group.

Highest in 1907	$29,788
Five years ending with 1886—Average	19,668
Ten years ending with 1891—Average	20,111
Twenty-six years ending with 1907—Average	23,114

Gulf and Mississippi Group.

In 1894—Lowest	$797
In 1905—Highest	6,910
Five years ending with 1887—Average	1,203
Ten years ending with 1897—Average	2,847

South Atlantic Group.

In 1894—Lowest	$1,424
In 1906—Highest	6,924
Five years ending with 1898—Average	1,943
Ten years ending with 1898—Average	2,624
Twenty-six years ending with 1907—Average	4,355

Middle Atlantic Group.

In 1907—Highest	$29,871
Five years ending with 1899—Average	15,569
Ten years ending with 1899—Average	16,871
Twenty years ending with 1899—Average	20,781

Central Northern Group.

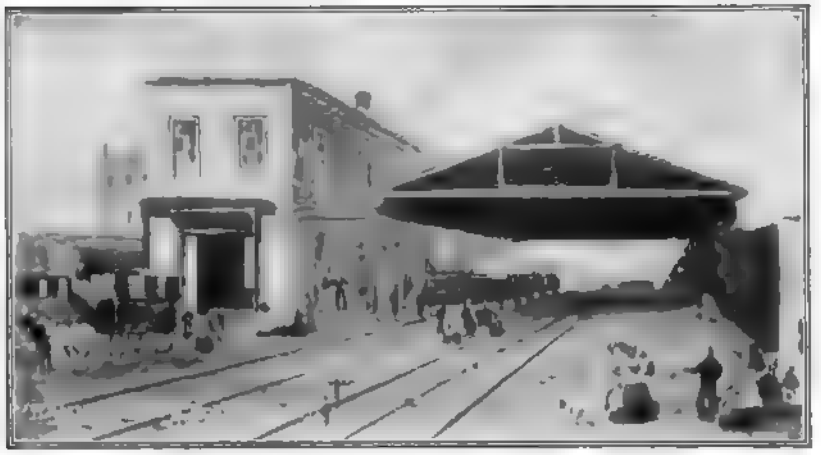
In 1897—Lowest	$7,553
In 1882—Highest	14,313
Five years ending with 1898—Average	7,970
Ten years ending with 1898—Average	8,377
Twenty-six years ending with 1907—Average	10,421

Northwestern Group.

In 1889—Lowest	$1,743
In 1906—Highest	29,241
Five years ending with 1890—Average	2,675
Ten years ending with 1895—Average	13,244
Twenty-six years ending with 1907—Average	11,981

United States.

For 1907—Highest	$17,155
Five years ending with 1896—Average	7,091
Ten years ending with 1898—Average	7,592
Twenty-six years ending with 1907—Average	10,439



RAILWAY OFFICE, LIVERPOOL, (1835). A QUAINT SCENE

SECTION XII.

THE COST OF CONSTRUCTION OF STEAM ROADS AT DIFFERENT PERIODS.

Sod Construction.

The belief at one time was widespread that a mile of first-class Rail Road could and should be built for not more than $15,000 to $20,000. The tradition is not entirely forgotten even to-day.

The impression came from the building cost of a very few early lines, either narrow gauge or what might be called "sod" Rail Roads, in the Western prairie states. These lines did not have to buy their rights of way, and had few engines and cars.

Getting Far Afield.

But the cost of a sod Rail Road is as far from that of a modern Rail Road as the cost of a sod house, dugout, or cabin, or, one might say, of a tent, compares with that of a modern residence.

Practically the last of the sod houses and dugouts have disappeared. So, also, have the cheaply and flimsily constructed Rail Roads, with their light bridges, small rails, insufficient ballast, steep grades and sharp curves. It is therefore obvious that the cost of a "sod" Rail Road cannot be considered a criterion by which to measure the cost of to-day's Steam Roads.

A Glance Backward.

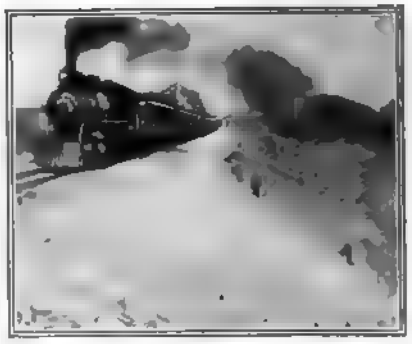
Suppose we review the general cost of Rail Ways at different periods, from 1829 to the present.

It is difficult to find how much was spent on each of the 2,196 Rail Roads now listed. Even less is known of the amount spent on many others now extinct. But enough facts and records are left us of the principal roads to give a very good idea of the average cost in the several eras since transportation used the new means of haulage.

The early lines show many instances approaching present expenditures, among them several New England roads, including the Boston & Lowell (1831-1835), which cost $56,600 a mile. By 1851 the cost of this road had increased to $88,000 a mile, although no additional mileage had been constructed.

A CURIOUS ENGINE, THE JAMES 1851

DALE CREEK FILL, WYO., SHOWING THE INCREASED COST OVER THE OLD SOD RAILWAY



The Great Western, now part of the Boston & Albany, cost $36,104 per mile; the Boston & Providence cost $43,460, and the Boston & Worcester, begun in 1831, $38,700.

$137,500 a Mile in 1839.

The Harlem Rail Road, built through New York City before 1839, cost $137,500 a mile for eight miles of road, including "depots, motive and other power."

The Mohawk & Hudson cost $38,000, and the Erie, as first built, exclusive of engines, cars and other equipment, $43,333.

The Early Pennsylvania.

The cost in 1834 of the first section of what to-day is the Pennsylvania, was $53,047 a mile, excluding depots, shops, etc.

The cost of the Allegheny-Portage Rail Road, completed in 1834, connecting canal transportation east with river transportation west of the mountains, was $44,545 a mile, and of the first part of the Philadelphia & Reading, $52,630.

It will be seen that even these early roads, all of them light and flimsy in construction, with what would now be considered baby equipment, cost from two to three times as much as the amount which some think a twentieth century Rail Road ought to cost.

"Way Down in Dixie."

In the South, where sandy soil, light grades, cheap timber and low labor costs offered the best conditions for inexpensive construction, the lowest cost of any of the early roads was $12,000 a mile, excluding stations, engines and cars.

We should not forget that in the South, as a rule, little was paid for right of way, and that much of the roadbed and bridges would hardly have stood the weight of modern trains at a standstill By the time 188 miles of the Baltimore & Ohio were completed in 1843, the cost reached $40,000 per mile.

OLD PHILADELPHIA AND READING RAILWAY STATION, PHILADELPHIA.

ITS SUCCESSOR, THE NEW ONE.

Increased Costs.

The cost of the 3,725 miles of the 79 Rail Roads in operation in 1845 was $109,850,000, or $30,000 a mile.

In 1850, the 9,021 miles of road then operating represented a cost somewhere above that of 1845. The traffic in those days was much lighter than now, for notwithstanding higher rates than are ruling now, the gross receipts of these roads was $4,000 a mile, or little more than half of what Rail Roads now expend per mile merely for wages, fuel and operation.

Minimum of Side-Tracks

The early roads had a very small percentage of side-tracks. Had the proportion been as high as to-day, the average cost would have been at least $10,000 per mile more. Terminals also were only in their infancy, both in size and cost, as they were in keeping with our cities. There were probably not half as many cars and engines per mile, the cost of which per unit was perhaps 50 per cent of what it is to-day.

Between 1840 and 1850, in the more densely settled regions, there was a largely increased cost per mile on many roads, which were reconstructed to enable them to bear the heavy burden of freight deserting the waterways for the Rail Ways.

On the Atlantic Coast.

From a report in 1851, of the principal Rail Roads in the well-settled states of New York and Massachusetts, the cost per mile appears to have been $52,000 and $59,000 respectively.

The Cleveland & Buffalo parallels the lake shore. It is on level ground, and with no rock excavation, cost more than $20,000 a mile for track alone. In the same section of the country other roads ranged in cost from $30,000 to $45,000 per mile.

High Cost Not a New Thing.

The Right of Way.

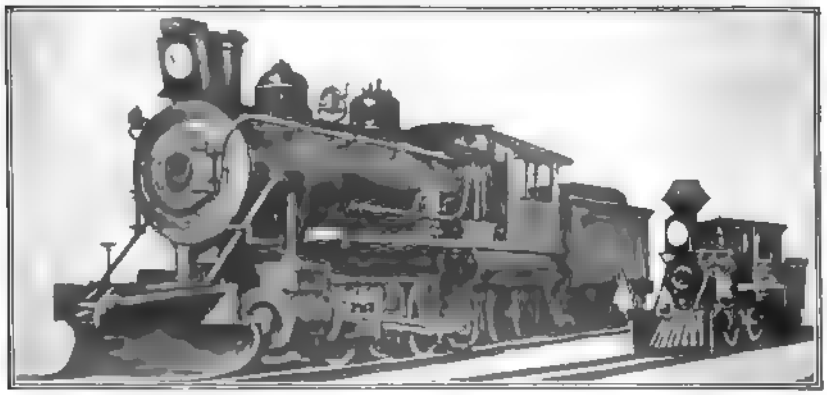
In some regions, even at that early day, the value of right of way was considerable. The estimates of an early Ohio Rail Road, 102 miles long, placed the value of the right of way before construction at $75,000.

In 1860 the average construction cost per mile had risen practically $3,000 above that of 1850.

Costly Steel Rails.

In 1865 steel rails cost $206 a ton; in 1867 the price dropped to $105; to-day the cost is $28. But in the meanwhile the number of tons necessary has gone up from 30 to 175 and even as much as 210 per mile. After 1870 began an era of substantial construction. The average cost of the 52,898 miles then in operation was already $44,000 a mile.

A good deal of that increase is represented by the reconstruction of Southern roads, many of which had to be practically rebuilt and re-equipped as a result of four years of neglect. In fact, little was left along the many hundreds of miles where the track had been torn up and bridges burned, as military measures during the war.



A COMPARISON OF THE MODERN AMERICAN LOCOMOTIVE

Light Engines.

How light were the cars and engines of even that day, can be judged when we find that Stonewall Jackson dragged a number of locomotives over the national turnpike from Martinsburg, W. Va., to Strasburg, Va., to get them from a Rail Road whose track had been destroyed to one on which the rolling stock had been burned.

The Central and Union Pacific roads cost $112,000 a mile, not-

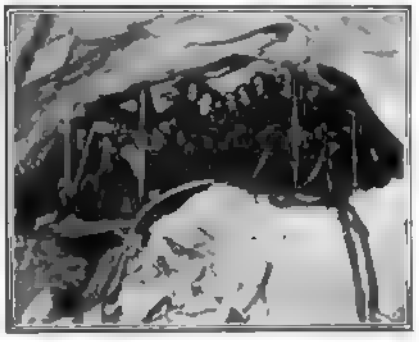
withstanding only slight expenditures for terminals and practically none for right of way. A tribute to the Union Pacific is the reduction of that capitalization to the present figure of $85,000 a mile.

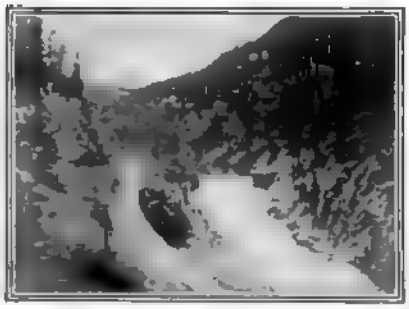
The construction of these Pacific roads over the high mountains of the West added $5,000 per mile to the average cost of the entire mileage of the United States.

A Railway Epigram.

The ties for much of the Union Pacific cost $2.50 apiece, and the rails as high as $135 a ton. But, as some one has said about this Rail Road, "If it cost three times as much as it should, it is worth three times as much as it cost."

DRIVING A HEADING IN THE CASCADE TUNNEL.





OVERLAND LIMITED PASSING POWER DAM

By 1880 the operated mileage had increased to 82,146, and the average cost per mile jumped to above $50,000.

The Cost of the Conquest.

There are many causes for this. For one thing, the Northern Pacific, built in the preceding decade, ran through a mountainous country, where construction was costly. Also, the mileage of auxiliary tracks had been greatly increased by this time, whose cost added largely to the average capitalization per route mile.

Almost 35,000 miles were laid with steel; locomotives had practically doubled in size and weight; the old cars had been replaced with heavier and better ones; numerous excellent stations had been built; the uniform gauge of four feet eight and one-half inches had been adopted, and the cost and value of right of way had increased very substantially.

From every standpoint, therefore, our roads had entered on that stage which provides not only for the traffic of the moment, but for that of the future.

Running Up Costs.

In 1900 the average cost of construction reached $56,500 a mile, for the 181,437 miles reported. The increase in twenty years had been 100,000 miles, and the mileage of sidings increased to 52,000. The mileage of tracks laid with steel rails increased from 157,000 in 1890 to 238,000 in 1900—92.4 per cent of the total trackage.

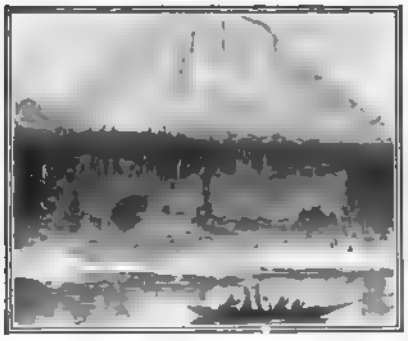
In the Twentieth Century.

The Cost To-Day.

The cost of the average route mile of Rail Road built to-day, according to Slason Thompson, is figured at $58,664, which is reduced, according to our "Capitalization," when we figure side-tracks and second tracks, to approximately $48,000.

Not to include these side-tracks to find the net capitalization, would be as inaccurate as to say that paving of the streets of a city with a thousand miles of avenues, costs $30,000 per mile, although the total of $30,000,000 includes the paving of 2,000 miles of side streets.

The cost of reproduction in Minnesota, practically a prairie state, where the construction cost is far below that in mountainous country, is estimated by the Rail Road commission of that state at not less than $54,210.



Mt. Hood from the Columbia

Box Canon, C M & St. P. Ry.

The Newest Far West Road.

The Chicago, Milwaukee, & Puget Sound, known as the Pacific Coast extension of the Chicago, Milwaukee & St. Paul, extending 1,400 miles from Mobridge—the name being an abbreviation of "Missouri Bridge"—in South Dakota to Seattle and Tacoma, was commenced April 15, 1906, and placed in operation in 1909; it established a record in Rail Roading.

This road had facilities for expeditous construction that were unknown when the other transcontinentals were built. Improved tools of all kinds were used, and other Rail Roads hauled its supplies.

$60,000 a Mile.

The road crosses three mountain ranges, two large rivers and many small ones. At its highest point it reaches 6,350 feet above sea level; its western terminals are at sea level. The cost was estimated at approximately $85,000,000, or about $60,000 a mile, but it is reported actually to have cost nearer $115,000,000, or $82,100 a mile.

A General Average.

Figures given for nine roads built within ten years, and altogether fairly representative of conditions in eastern and western New York, West Virginia, Pennsylvania, Texas and Central and northeastern Ohio, show an average cost of $49,000 a mile, exclusive of stations and signaling equipment, the rails used averaging 80 pounds to the yard.

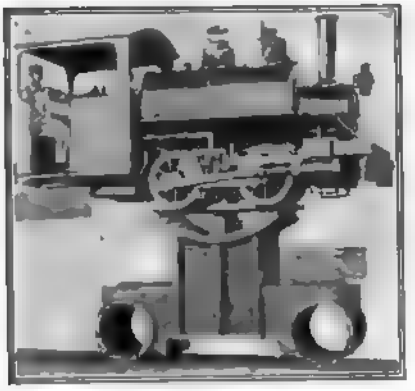
Engineers estimate that the cost of the Western Maryland averaged $100,000 per mile. The Tide Water Rail Road in Virginia and West Virginia is said to have exhausted an appropriation of $125,000 per mile for construction, and the Clinchfield & Carolina about the same amount.

With Flail and Scythe.

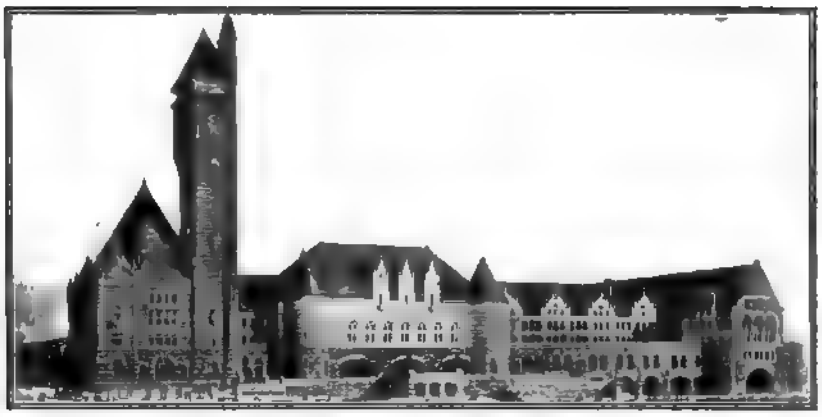
When man sowed his wheat broadcast and threshed with the flail, cut his hay with a scythe and his wheat with a cradle, he needed neither grain drill, mower, reaper, nor any of the other modern labor-saving and economic devices of the present-day farm.

So, too, the old-time Rail Road, with its three or six-ton locomotive, its ten or twelve-pound rails, perhaps its narrow gauge, its four-wheeled, six-passenger cars and three-ton freight cars, was "sufficient unto its day." But in the present we need engines weighing 150 to 300 tons, freight cars of 50 tons capacity or more, passenger cars with seating capacity for 75 or more passengers.

These additions have meant more money for cars, for engines, for road and for terminals. Hence no more can there be a Rail Road meeting present-day needs for $20,000 a mile. The tradition of the past is of interest only as an exhibit, it is not of use in the present.



A NARROW-GAUGE LOCOMOTIVE RESTING ON THE CYLINDERS OF A MODERN LOCOMOTIVE



THE GREAT UNION STATION, ST. LOUIS.

SECTION XIII.

THE ANALYSIS OF A RAIL ROAD.

Analysis of the Cost.

A Big Subject. The writer, notwithstanding his earnest study of the question of transportation, has yet found difficulty in getting some of the salient and important facts of the story so clear that all might see them in their true relationship.

Incomprehensible Figures. If you were to tell Mrs. Smith, Mrs. Jones, or the average American woman, that she could go to the store and get a millimeter, a meter or a kilometer of silk for one dollar, she would probably not know which to ask for in order to get the largest quantity. She would not know that a millimeter is only thirty-nine hundredths of an inch, or about the width of her little fingernail; that a meter is little more than a yard, while a kilometer is 1,032 yards, or nearly two-thirds of a mile.

Rail Road figures are almost as confusing and unintelligible to the average individual as the metric system.

The reason for the lack of general comprehension lies in two facts.

Technical Terms.

First, Rail Road figures are usually given to the public in the necessarily vast aggregate sums which are reached for the nation, and for the large systems covering thousands of miles, doing the draying for many states, resulting in hazy and distorted ideas. Second, such terms as ton-miles, passenger-miles, gross and net earnings, capitalization, bonded debt, etc., are beyond the grasp of the average person, and confuse the layman's mind still further.

A Comprehensible Basis.

It occurred to the writer that if a mile of Rail Road were taken and analyzed so that it might be determined how much work it does daily and what it gets for this labor, the story would be so simple that all could readily understand the important features of the industry as they are related to commerce, progress and prosperity.

Everybody knows what a mile is and everybody knows what a day is; both are familiar and easily-grasped units and terms of comparison.

As the Matter Stands.

We shall, therefore, base our figures on these "retail" and commonplace terms of measurement to give a correctly proportioned idea of the great transportation business.

We shall see:

Just what a mile of Rail Road is composed of.
What it costs, item by item.

We shall later see:

What is the volume of the business it conducts.
What is the value of the goods it handles.
What is received for doing this business.
What is earned in a day.

THREE LEVELS IN RAILWAY MOUNTAIN CLIMBING

The Mile of Rail Road in Detail.

Not What They Seem.

Many a person, in thinking of the expenditures incurred in building a Rail Road, considers only the rails, ties and ballast, figures these as being some sticks of wood, some iron and stones, of little cost, and believes this all for which money has to be spent.

It would be almost as logical to consider a pile of bricks and some mortar as a house and omit the important items of other materials, foundation, cost of construction and of the land on which to build it, as to think that the items mentioned above constitute a Rail Road.

What It Really Is.

After having been under this impression it is rather astonishing to find that there are more than 27 items other than ties, rails and ballast entering into and necessary for the construction of a Rail Road.

We will take for an example of cost the construction expense of 5,785 miles of Rail Road in the Northwest, built comparatively recently, which provides an equitable basis of reckoning.

GRADING BY INCLINED RAILWAYS FROM A LARGE BORROW PIT

GRADING TEAMS

Grading.

Preparation for the Road.

After a practically level base or road on which to lay the rails and ties has been secured, by comparison all other items are individually small. We must remember that while we can locate a house where we please, a Rail Road must go where the lay of the land carries it. The road or roadbed must be built before we can have a Railed Road.

It is surprising to learn that it takes, in some instances, two or more years to grade the road for a single mile of line.

It Takes Time.

It is also astonishing to learn how many different trial or preliminary surveys are sometimes necessary. More than 200 had to be made to find a line where cost of right of way and grading would not be prohibitive, to save mileage in getting around a certain Eastern city and to prevent the carrying of all the freight through an already crowded tunnel. The surveys in this instance alone cost thousands upon thousands of dollars for only about 20 miles of line.

Fitting a Rail Road.

Some tailors can do the apparently impossible feat of making a consumptive-looking freshman appear like the athletic "center" of a football squad. But their work is easy compared with the difficulties of perfectly measuring a Rail Road to a rolling or mountainous

country, or cutting and padding the hills and valleys to the grade of the Rail Road.

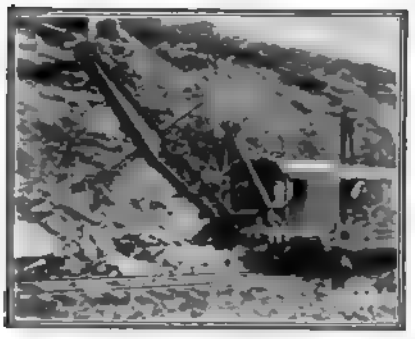
Grading the Road.

The layman seldom realizes that there are but few lengthy stretches of land where Rail Roads are running or are to be run which are not so irregular that it requires months to cut, fill and round the ground in such a way that a road may be made which is safe and solid as a bed for the rails. Each hill has to be cut through, as locomotives and trains should not be required to climb grades or hills that rise more than 26 feet to the mile.

To illustrate: let us imagine that we had to walk across country, between two great cities or two important sections, and we were physically so constituted that notwithstanding intervening hills, mountains, valleys, rivers, houses, towns and cities we could go upward or downward no more than six inches in 100 feet of distance, and could turn to the right or left only one foot in 30. Imagine the changes that would have to be made to provide a walk at least 18 feet wide filling these requirements, and how large would be the expense of the process.

Helping Nature.

Each sloping river bank has to have a notch cut in it and be padded or filled to make it an even and substantial base; frequently retaining walls have to be built and sustaining piles used in soft places; in short, every obstacle of nature must be removed and every deficiency made good.



EXCAVATING FOR DOUBLE TRACK

OLD AND NEW LOCATION, U. P. RAILROAD.

For the Steam Road we are discussing the cost of grading averaged a little over $2 per running foot, or $12,303 per mile. The cost of piercing tunnels added $757 to each mile of road.

Both these amounts, of course, are subject to wide variation. The expense for a certain line for grading was $4,224 per mile and for another road $32,702. The writer knows of a section of road part of which cost no less than $200,000 per mile to grade.

The Roadbed.

Did you ever stop to think that the road for the rails, or roadbed for a single track road, must have a width of 18 feet, or be broad enough for three wagons to go abreast without crowding? The 18 feet of roadbed

are divided as follows: The tie is 8½ feet long, the toe or sloping ballast extends for three feet farther, half on each side, and the ditch, which is used as a walk, for material and to prevent wash, is three feet and three inches on each side.

Distributing the Weight.

The weight of the train comes upon the track and then goes to the ties, whence it is distributed to the ballast, finally being transferred to the roadbed. If the enormous pressure were to pass directly from the ties to the roadbed, the passing of each train would cause the same to sink considerably, then to spring up again. This naturally would have a weakening and ultimately dangerous effect, and in time of rain would make a mud-hole under the tie and destroy its ability to support the rail, and the latter's ability to support the train.

Proportion.

In the case of a hill or valley, the former necessitating a cut and the latter a fill, the bank on the sides of the road must be made at an angle sloping downward or upward one and a half to one or sometimes two to one. The earth removed from a hill, when a Rail Road is so graded as to pass through it, is in the shape of a slice of cake or cheese, with the sharp end cut off.

The embankments are necessarily sloped in this way for the purpose of distributing the load of the train and giving support which will not wash away during storms; also, because the earth will not stand up if piled vertically.

A Big Item.

At one and one-half to one, such a cut 20 feet deep would be no less than 78 feet across the top, so that about 1,000 cubic feet of material would have to be removed for each running foot of track.

A valley of only 20 feet depth, but which at the same time might be a mile wide, would require, in order to fill it, a pyramid of material the reverse in shape, 78 feet at the bottom and 18 feet at the top. Think of a causeway of this kind to be artificially created!

BUILDING BRIDGE PIERS BY CABLE WAY.

CLOSING THE BREAK IN THE COLORADO RIVER

A BIG JOB
FILLING TRESTLE ACROSS VALLEY ON UNION PACIFIC NEAR SOUTH OMAHA.

Pyramids of Earth.

If, as happens not infrequently, the cut be 40 feet deep, it has to be about 136 feet across at the top. This requires the excavation of no less than 3,120 cubic feet per running foot of track, while such a fill would be just the reverse of this.

The cost of removing rock is from 80 cents to $1.20 per cubic yard. Earth for fills costs from 15 to 25 cents a cubic yard.

The Individual Items Making Up a Mile of Steam Road.

In considering the physical items in the make-up of a Rail Road, let us first turn to the rails.

The Cost of Rails.

We should remember that each mile of track requires two lines of rails, thus representing 10,560 linear feet of steel, weighing, on modern and well-equipped tracks, from 28 to 33 1-3 pounds to the foot, a third of a million pounds to the mile.

The rails cost $28 per ton at the mill, to which transportation charges have to be added. In this particular case the cost for rails was $4,765 for each mile of track.

Ties.

Each mile of track requires from 2,600 to 3,000 ties, worth in the various sections of the country to-day, including freight and delivery, from 45 to as high as 95 cents each. The cost of the ties in this case was $2,387 per mile.

Ballast.

Four-fifths or more of a cubic yard of broken stone or gravel ballast are used to each tie, costing from $1,424 to $2,500 per mile. The differences are caused by the varying length of haul from the quarry.

The cost of engineering must not be overlooked. A Steam Road is essentially the creation of the engineer. He is more necessary to lay it out, design it and superintend its construction than in the building of almost any other structure.

Engineering. The cost of engineering services varies with the difficulties encountered. In the case cited it was 24 cents a foot or about $1,250 a mile. Many trial and preliminary surveys had to be made before the best location was obtained, and a corps of engineers had to be constantly on hand during the entire work to give grades, cross sections, watch the contractors to see that they did their work properly and to make up the estimates on which they were paid.

So constant are the demands upon their time that during the construction of a Rail Road it is customary for a corps of resident engineers to live along each section of the road, usually not exceeding 10 miles in length, and in the case of difficult work even less.

Unseen Difficulties. The writer remembers a case where many days were spent by an engineering corps of 15 men trying to fit in a preliminary line one-fourth of a mile long around a difficult point; in another case, engineers ran 26 miles of preliminary line for a Rail Road, only to be compelled to abandon the work, owing to having been misinformed as to the height of the mountain to be crossed. They found, after doing a portion of the work, that they would ultimately still have been 1,000 feet in vertical distance below the top of the mountain which it was aimed to cross.

TRAIN ON PECOS RIVER BRIDGE, TEXAS, 321 FEET HIGH. ONE OF THE HIGHEST BRIDGES IN THE WORLD.

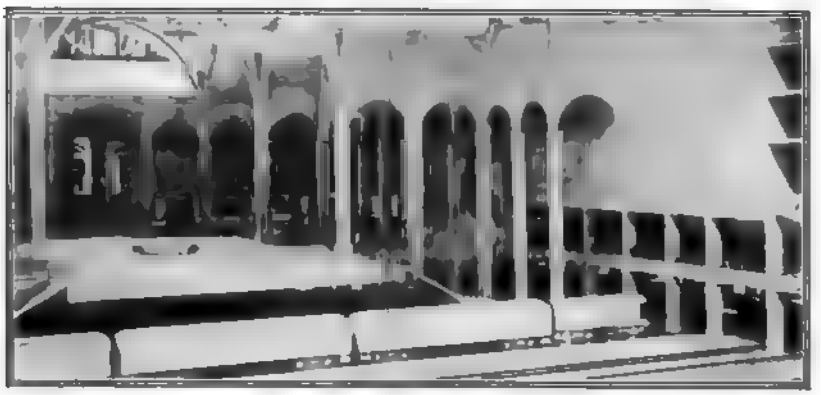
Bridges and Trestles. Then come bridges and trestles. Every Rail Way embankment is a dam across every valley or depression crossed by the Rail Road, in which pools and reservoirs would form in time of rain. These, pressing upon the embankment, would undermine it, and the track would be in danger of being washed away.

Thus, dry and flood watercourses, as well as the living streams, have to be provided with drainage, by culvert or bridge, and these little matters caused an expense of $3,517 a mile on this particular road. A single large river to be spanned may cost hundreds of thousands or even millions of dollars.

Track-laying. The items of track-laying and surfacing are of great importance and entail considerable expense. Included under this joint head is the pay to labor for the placing of the ties and the fastening of the rails to them. The bringing to grade and surfacing require an exact eye and careful hand, as upon the smoothness and security of the track depends the safety of the passengers and wares passing over it. This cost the road $1,309 per mile.

Shops. The shops, roundhouses and turntables for the convenience, grooming and repair of the iron horse, and the car and repair shops, cost $686 for each mile; in some cases on large systems in populous sections it costs perhaps twice as many thousands as this is hundreds.

Docks and wharves for the loading and unloading of wares received from a vessel or to be transported by water cost $251.



INTERIOR NEW PENNSYLVANIA RAILWAY STATION, N. Y., DURING CONSTRUCTION.

Terminals. The terminal facilities at the main end of the line of this road represented an outlay of $425 for each of the 5,000 miles. We show, in our article on "Yards and Terminals," that the cost of terminals in many cases in the East is many, many times as much.

These expenditures are absolutely compulsory. The equipment requires these stations and terminals, no less than the ship must have a dock to tie up against to discharge and receive its cargo, as well as anchorage.

The Required Smaller Details.

Miscellaneous Items. Further, and entirely overlooked by the casual observer, come in such items as track fastenings, costing $632 per mile; frogs and switches, amounting to $204; fencing of right of way, $131, crossings, cattle guards and signs, $50, telegraph lines for transmission of train orders, $249; track tools, hand cars, etc., $190; the fuel stations for coaling engines, $110; water stations, $340; warehouses,

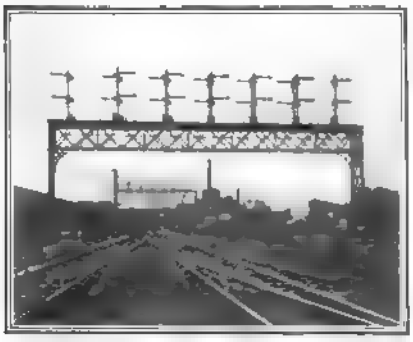
$498; the many miscellaneous structures, section houses, cattle pens, etc., amounting to $397; legal expenses incurred in securing right of way, $50; general expenses, another $50 a mile; interest and discount, $6,159.

Interest. The last item is explained by the fact that the Rail Roads are like houses for which money must be borrowed in order to build them, the interest account running from the time that one secures the money, not from the completion of the building.

When a Steam Road is built, the money has to stand out and interest be paid on the necessary funds for each mile complete or partially complete, although it is usually several years until the whole road is in operation, while the entire investment is outstanding. It is only then that a definite source of revenue is gained. This accumulating interest, with the commissions for the sale of the securities, amounts to from 10 to 20 per cent of the cost.

Signals. The elaborate system of signals demanded by the public costs from $500 to $12,000 a mile, the latter in the case of the electric zone of the New York Central.

On the road with whose figures we are dealing, as in fact on every road, there were unforeseen contingencies to be reckoned with. Rail Roads, like houses and the Panama Canal, are seldom built within the estimates made for their construction. Only 5 per cent instead of the customary 10 per cent on the cost of construction was checked up to contingencies or variations from the engineers' estimates in this instance, and yet the item amounted to $2,245 per mile.



BLOCK SIGNALS

TRACK DEPRESSION AT GRADE CROSSING. SWINGING A GIRDER INTO PLACE.

Reshaping. The impact and agitation of the first trains on the roadbed causes packing down of the ground which has to be made good by refilling and reshaping, adding about 10 per cent to the original cost of grading.

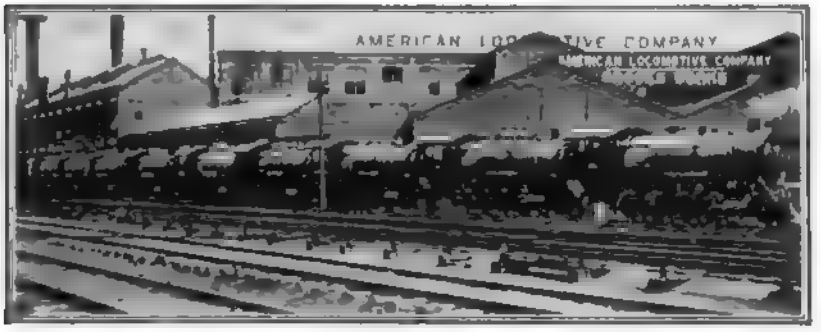
The total cost of a mile of this track was $41,198, exclusive of the cost of either right of way or equipment.

A number of miles of side tracks were built, which cost less and would reduce the general average to $38,000 per mile.

Cost of Building. These figures are not high when the difficult nature of the territory through which this road passes is considered, for even in the case of a mile of Rail Road in a section with few hills the cost amounted to $20,000 a mile, and appurtenances another $20,000 per mile. These figures were exclusive of right of way. In another section through a timber district the contractors were ruined by trying to build a single-track road for $28,000 a mile, without being required to provide right of way or rolling stock.

Examples. Although occasionally we find the cost to be no more than $14,500 for a mile of track and roadbed, there are many cases where the expense has been as high as $150,000, and an instance where it was as high as $850,000 per mile. Several hundred miles of a road recently built cost $200,000 per mile.

An expert says that one could not build a mile of Rail Road in any average section east of the Mississippi River to-day for less than $50,000 per mile. As over 60 per cent of our trackage is in that section of the country, it would seem that the average cost throughout the country cannot be very much below that figure, especially as west of the Mississippi the cost of mountain crossing adds materially to the expense.



A TRAIN OF MODERN IRON HORSES, LEAVING THE WORKS WHERE BUILT

Equipment.

While equipment is a very important item, entailing immense expenditures, we will treat it briefly, and without elaboration.

Locomotives. An ordinary locomotive is worth $15,000; and there is one for each six miles of track. A list of 240 locomotives bought in the latter part of 1910, by three different roads East and West, cost an average of $21,379, which would seem to indicate this as a fair price for an engine to-day. Locomotives, therefore, add an expenditure of not less than $2,500 to each mile, including second and side tracks.

Passenger Cars. Passenger cars range in cost from $4,000 to $16,000, and $8,000 is a fair average. There is a passenger car for each five miles of road, so that $1,600 covers this item for the average mile.

The cost of freight cars runs from $600 to $1,200, and as high as $1,400 and $1,600 for the 80,000 and 100,000 pound and special cars.

The Analysis of a Car.

One can see how easily such prices are reached when the separate items which go into the car are considered. The body of the modern freight car alone will cost about $470, the frame $300 and the trucks no less than $423. Including steel wheels, metal bolsters, metal center sills, air brakes and couplers, the sum of $1,431 is reached.

Of freight cars, an average of approximately seven, besides extra parts and appurtenances, exists to each mile of track, including second, side and yard tracks. Approximating these at an average of $1,000, this item means an expenditure of $7,000.

Therefore the equipment of the average mile of Rail Road represents an investment of about $11,100.

Right of Way and Terminal Facilities.

Location Important.

The exact value of a mile of Rail Road cannot be even approximated without fully considering the almost priceless advantages of location and the terminals of the Rail Way systems. The enormous assets which these represent, except as they are included in transfers of ownership under foreclosure proceedings, are seldom represented in the present book cost of the Rail Ways.

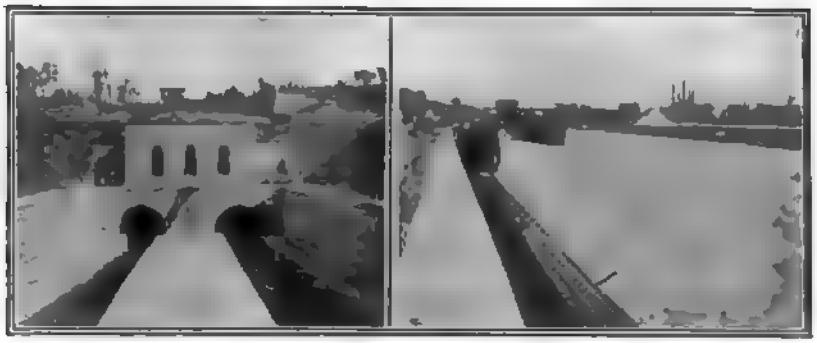
In some cases, notably those where Rail Roads have large terminals in the hearts of great cities, these alone are worth as much as the total capital stock.

Spending for Terminals.

To give an example of the value of terminals, it is interesting to note that the Pennsylvania Rail Road is making an expenditure of approximately $120,000,000 to secure a terminal in and tunnels into New York City.

This means that for the sake of advancing its line little more than five miles from Jersey City into and across New York, the Pennsylvania will expend $132,000 a mile for each of the 908 miles

LOADING CARS INTO A STEAMSHIP AT A LAKE TERMINAL.



THE JERSEY ENTRANCE AND LONG ISLAND EXIT, PENNSYLVANIA TUNNEL, NEW YORK.

of its route from New York to Chicago. The Pennsylvania Lines are charging off $7,000,000 a year out of net earnings to cover this outlay, so that these conveniences may not become a burdensome fixed charge.

Increment.

The original cost of the New York & Harlem Rail Road, including the right of way into the heart of New York City, was only $2,200,000, less than $84,000 for each of the 26 miles of line. The expense of the Pennsylvania, consequently, is over 54 times as great as that incurred by the Central in earlier days.

The New York Central, however, finds that it also has inadequate facilities for its great business, and being more centrally located, finds it necessary to enter into expenditures which will ultimately amount to $180,000,000 to improve, enlarge and modernize its already existing terminal. Although they got the original land cheaply, it costs enormous sums of money to keep pace with the times. The addition of real estate alone is said to have cost $60,000,000.

Six Hundred Millions

The total expenditures of the Delaware, Lackawanna & Western, the Erie, the Pennsylvania, the Hudson terminals, and those of the Rail Roads entering New York from New Jersey, and those of the New York, New Haven & Hartford to get its new lines into the Bronx, with the expenditures necessary for the two stations mentioned above, will probably consume a total of from $500,000,000 to $600,000,000 for additional terminal facilities in and around New York City.

The average cost of right of way in the United States, as figured in our article on this subject, amounts to $10,000 per mile, or about $2 per foot.

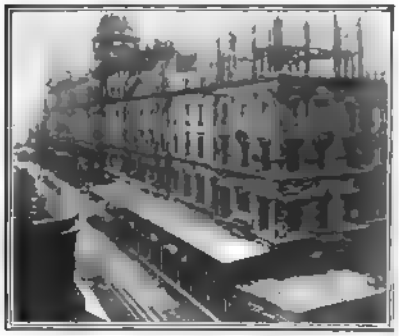
A Great Deal for the Money.

To check the figure: does the reader think he could purchase a strip of land right across the United States, through cities, towns, fields and farms, for less than $2 per running foot, paying all damage to adjacent land, especially as, where there are cuts and fills, the strip of land is often from 100 to 200 feet wide?

Checking the Cost of Rail Roads Per Mile.

Cost Per Mile. "The Rail Road Gazette" in 1906 published a series of articles on the unit cost of Rail Road building, in which certain examples of the cost of construction (exclusive of real estate, stations, equipment and signals) were given. According to this, the expense on the plains of Texas averaged $19,649 per mile On the slightly undulating ground of Ohio the cost averaged $40,000, while over the mountainous regions of Pennsylvania and West Virginia it reached $60,628 and $78,000 respectively. Add to these sums $10,000 for equipment and $10,000 for right of way and see what large figures result.

To these estimates at least 10 per cent might well be added, as the Gazette's figures were made previous to 1906, since which time there has been a very large increase in the cost of constructing a Rail Road.



A SPLENDID RAIL ROAD BUILDING BEING TORN DOWN TO BE REPLACED BY A MORE MODERN ONE

THE STEEL SKELETON OF THE PENNSYLVANIA STATION, NEW YORK.

Double Track. For double track, the cost of construction ranged from $50,000 in New York to $154,000 in West Virginia without equipment.

In one instance the cost of construction reached a total of $816,000 per mile.

Adding the detailed figures given in our list, it would seem that the cost of an average mile of Rail Road can be approximated as follows

Construction (including second and side tracks)	$38,000
Right of way.....	10,000
Freight cars	7,000
One-sixth of the cost of a locomotive at $15,000.....	2,500
One-fifth of cost of passenger car at $8,000	1,600
Total	$59,100

If this total seems excessive, though it certainly represents an actual and practically typical mile of Rail Road, you may deduct 35 per cent and still get a figure larger than the present average net capital of a mile of Rail Road

WHAT A MILE OF RAIL ROAD DOES.

The Volume of Business It Conducts for the Public.

The Universal Partner. The steam drayman handles the major part of the products and business of the manufacturer, farmer, miner, lumberman, and other producers, merchants and traders throughout the entire nation; and thus the volume and value of goods handled by the Rail Roads probably equal that of all the others combined, as many articles are handled many times.

What Each Mile Handles. We should remember that for each active mile of track there passes each day through the hands of the Rail Road merchant about 1,751 tons of freight requiring 1,800 tons of equipment, including empty cars, together with 233 passengers, who, with their equipment, weigh about 1,500 tons, a total of 5,100 tons, enough to load a good-sized cargo steamship.

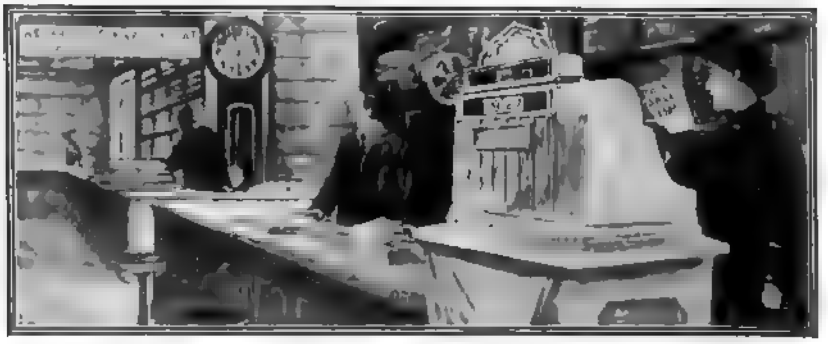
What the Rail Road Gets. It has been considered that cotton linings and mohair, which roll very closely, in point of bulk are typical Rail Road freight, and the writer bases his calculations on the space occupied by cases of these goods.

A TRAIN OF HOUSES ON THE WEATHERFORD AND MINERAL WELLS RAILWAY, TEXAS.

On this basis, the load of freight carried over each mile of Rail Road, each day, would be almost equivalent in bulk to a row of two-story detached cottages one-seventh of a mile long.

Freight Receipts. The Rail Road, for carting or moving a pile of freight this size, weighing 1,751 tons, receives payment at the rate of .00763 of a dollar per ton, a gross revenue of only $13.36.

For hauling 233 passengers who pay 1 9-10 cents each, the Road receives a total of $4.49 for each mile for its day's work of carrying passengers.



THE AVERAGE MILE OF RAILROAD WITH AN INVESTMENT OF $50,000 TAKES IN LESS THAN $20.00 A DAY.

Mail and Express.

Further, the Rail Road gets 30 cents daily for hauling mail, and for miscellaneous matter, including express, $1.03, so that the total receipts of a mile of Rail Road, per day, are $19.27. Therefore, if we consider each mile of Rail Road as a separate business, with $50,000 invested, we find its gross sales less than $20 per day.

It would be difficult to find any other business with an investment of that sum with gross sales of under $20 a day.

What Others Would Want.

We show in our article, "Roads Versus Rail Roads," that 140 wagons, for freight alone, and 47 carriages for passengers, would be necessary to do and maintain the continuous hauling done over each mile of Rail Road. Consider what the toll charges would be and what the cost of carriage for passengers, freight, mail and express passing over the road.

It is worth while to consider how much gross and net receipts one would want for building a macadam road in front of his house, and keeping it in order for such traffic as goes over each mile of Rail Way track daily.

Toll Charges.

On turnpikes in Pennsylvania and New Jersey the toll over country roads is from two to ten cents a mile for wagons and teams. At this rate the road toll alone over a turnpike, about the only road which would stand such traffic, for wagons sufficient to handle the traffic handled over a mile of Rail Road would be from $3.74 to $18.70 a day, allowing nothing for the hire and upkeep of vehicles, feed for animals, wear and tear, pay of drivers, etc.

The Net Return.

Take the freight passing over one mile of Rail Road daily, at the average value, which is sometimes estimated at a cent a pound, and the freight handled would be worth approximately $35,000. On the basis of such an estimate, no less than $12,775,000 worth of goods are handled over each mile of Rail Road in the United States.

MILES OF CARS AND SIDE-TRACKS, ALTOONA

SECTION XIV.

THE ANALYSIS OF THE PROFITS OF A RAIL ROAD.

The Profits Per Day on a Mile of Rail Road.

Official Data. The writer has made a careful research into the mass of official data, authoritative Rail Road records and statistics covering the past quarter of a century and more of their operation in the United States, to find what have been the actual profits to the owners of the business, the stockholders.

By Groups. He divides his research into eight divisions, one for each of the popularly-known groups: the New England, Middle, Central Northern, South Atlantic, Gulf and Mississippi Valley, Southwestern, Northwestern and Pacific States, so as to make it specific rather than general.

The reader knows in which group he lives, and can see what the people of his and other sections have actually paid in profit for their Rail Road facilities in the form of dividends.

Most Profitable Period. The twenty-six years ending with the year 1907, in which the greatest extensions and most improvements have taken place, have been the best since the Rail Roads began, and doubtless represent larger profits than the earlier periods, so that moderate, if not

meager, as this statement shows Rail Roads profits to be, it nevertheless gives figures probably better and higher than for the earlier periods of Rail Road operation.

Per Mile Per Day.

The writer has figured out the profits of a mile of road per day in each group; he has done so upon a basis of the total mileage, for, as has been stated a number of times herein, there seems no reason why one mile of Rail Road should be distinguished from another, merely because of a difference in name, as their functions are all part of a necessary whole, any more than only the stallions in the livery stable should be called horses and counted among its stock, and the geldings and mares be omitted.

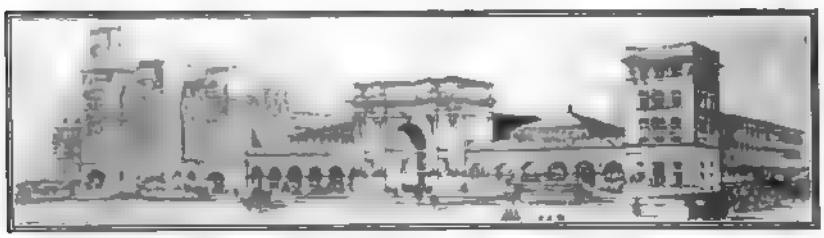
THE FIRST SOUTH AND NORTH STATIONS, BOSTON. COMPARE THESE WITH THEIR SUCCESSORS, WHICH FOLLOW.

The New England States.

Trunk Line Territory.

In one of our older groups of states, the New England, consisting of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut, embracing three of the states which are the most densely populated in the Union, the seat of our most important manufacturing industries, the Rail Roads handle not only the products of their own territory, but do the additional work of handling much of the raw materials and manufactured products of other parts of the country two and three times

This and the group of Middle States are called Trunk Line territory, gaining this name from the resemblance to the body or trunk of the human being, for from the roads in these territories branch off the circulation to the arms and legs of commerce.



PRESENT NORTH STATION, BOSTON

THE NEW SOUTH STATION, BOSTON.

Cotton to Cloth.

For instance, the raw cotton is sent from the South to the mills of New England, and after it is manufactured it goes, say to Boston, for distribution; the same goods are then shipped to New York, to the wholesaler, and, after this, started on their journey to the consumer.

The Shuttle of Commerce.

So with shoes; first the hides go to Boston, then to a tannery, thence back to a leather house in Boston; then the leather goes to a shoe factory, and the shoes back to Boston again to the distributer, who sends them to every section of the country, and perhaps even abroad, the freight expense being paid by the merchant at destination.

So it is also with wool for clothes, iron for the smaller articles of hardware and manufactures general, throughout New England's long list of industries.

Canada Helps Pay Freight.

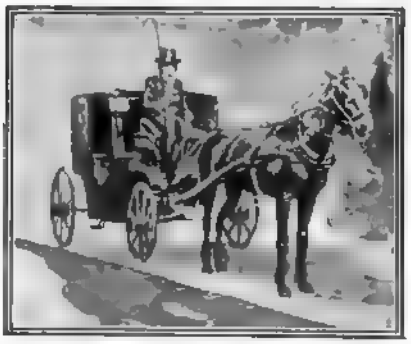
Added to the revenue from the above, we must consider that important ports like Boston and Portland get a substantial portion of our exports. In the winter months, while navigation on the St. Lawrence is closed, New England ports are the outlets for a large part of the export and import business of the Dominion of Canada.

It appears, then, that outsiders help largely to pay the freight on New England Rail Roads. The people of New England, although they pay only a part of the transportation cost, get the commercial benefit of manufacturing all these goods and of the wages spent in the industries.

$4.08 a Day as Profit.

With all these advantages, with their density of population, and notwithstanding the practically double service to the people of the nation, the highest amount paid in profits to the owners of a mile of Rail Road, in these states, in a quarter of a century was in 1907, when they received $4.08 a day.

The average, even with all the assistance recounted above, for the five years from 1882 to 1886, was only $2.69; for 10 years, from 1882 to 1891, it was $2.75 per mile a day.

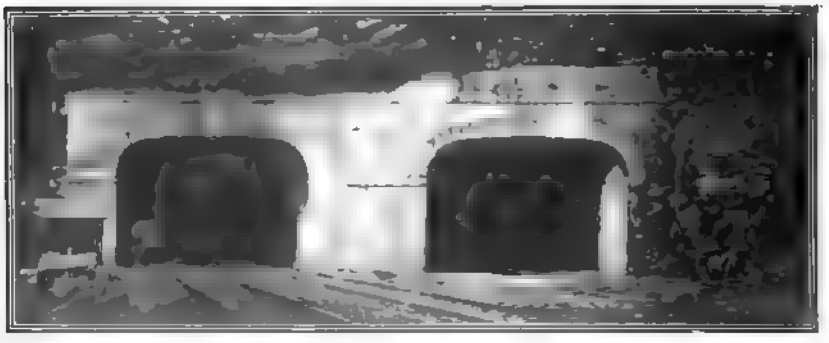


THE NEW ENGLAND RAILWAYS DID NOT PAY DIVIDENDS ENOUGH PER MILE TO HIRE A HACK FOR A DAY.

$3.15 a Day for 26 Years.

For 26 years, the owners of the public highways, the great truckmen and liverymen to whom belong the iron horses, freight wagons and passenger coaches, received an average net return of $3.15 a day per mile.

It is interesting to think that a mile of these Railed Roads, costing thousands of dollars, with its numerous coaches, and freight cars costing thousands of dollars, earns only as much net for its owner as might a single hack!



ENTRANCE TO THE D. L. & W. TWIN TUNNELS, SCRANTON.

The Middle Group of States.

A Great Worker.

In the Middle Group of states, including New York, New Jersey, Pennsylvania, Delaware, and Maryland, the situation has been somewhat better than the average. This is owing to the fact that they are densely settled, that manufacturing is carried on in them to a large extent, and that their Rail Roads also transport a great deal of the same class of products as do those of the New England states.

The enormous traffic of the iron and coal industries distributed

to a wide territory, also contributes largely to the more favorable result.

Only $4.09 a Day.

Even in this region, and although the money invested in Rail Road rights of way, terminals, real estate and other property, amounts to much above the average, we find that the highest amount of profit made on a mile of Rail Road per day, was during 1907, in the period of the biggest business and greatest Rail Road prosperity in the history of the nation, up to that time, when it amounted to $4.09.

Even during that year the profits of a man who owned singly all the stock in a mile of Rail Way working exclusively for his benefit and profit would not have paid his board at a first class metropolitan hotel.

Not a Wage for a Carpenter.

The average for five years, from 1895 to 1899, inclusive, was $2.13; for the 10 years from 1890 to 1899, inclusive, it was the sum of $2.31 a day; for 20 years, $2.58. The average for 26 years amounted to $2.84 a day per mile of Steam Road.

THE MIDDLE ATLANTIC RAILWAYS DID NOT PAY DIVIDENDS ENOUGH PER MILE TO HIRE AN EXTRA CARPENTER.

No union carpenter would work even an 8-hour day at these wages, while this Rail Road business to make such a sum works three times as long, or 24 hours without rest or sleep.

Where More Means Less.

As the tonnage on these Roads is perhaps double to triple the average, the net profit for work done is less than in some of the other sections

If we were to figure the returns, not on the basis of general averages but for each ton handled and dollar invested, the profits would probably be seen to be no more in proportion than in those states which make the poorest showing

12 Tons 1 Mile for 1 Cent.

The best equipped Rail Road in the United States, the Pennsylvania, has to haul 12,000 pounds, besides 12,000 pounds of equipment, a total of 24,000 pounds, or 12 tons, for a whole mile to make one cent net on freight traffic. If this work were done by ordinary, instead of steam horses and steel wagons, the return would seem meager.

One street car in ordinary service would make much more money over a right of way on an already graded street furnished by a city. And the street Rail Way does not have to maintain the great terminals, freight and floating equipment of the Steam Road.

THE GULF RAILWAYS IN THEIR BEST YEAR DID NOT PAY ENOUGH DIVIDENDS TO HIRE AN EXTRA NEGRO SECTION HAND PER MILE.

IN 1894 THE DIVIDENDS PER MILE WOULD HAVE BOUGHT ONLY A CIGAR A DAY FOR THE STOCKHOLDERS TO DIVIDE.

The Gulf and Mississippi Valley Group.

Never More Than 94 Cents.

The Rail Road owners in Alabama, Mississippi, Tennessee, Kentucky and Louisiana have never gotten as much as one dollar per day for conducting the important and expensive business of operating a mile of Rail Road. Their best profits in a quarter of a century were made in 1905, when there was a daily return of 94 cents per mile.

Notwithstanding the large amounts of capital wiped out by foreclosures, and notwithstanding the assessments levied on stockholders in many of these states, the shareholders collectively in 1894 could have shared one 10-cent cigar a day, to enjoy which they would have had to smoke it in the Indian "pipe of peace" fashion.

Not Bloated Capitalists.

For the five years, 1883 to 1887, inclusive, they could have divided a cocktail, for during this period the roads averaged earnings of 16 cents per day. If these dividends on a mile of road had been put back into the property, they would not, in a whole year, have enabled the purchase of a new hand car or any but a modest desk for the offices.

From 1894 to 1898, inclusive, they got one cent more, or 17 cents. They had a grand average of 39 cents, as their return, during the ten years from 1889 to 1898.

Slighting the Servitor

The people dependent on a whole mile of Rail Road were served with three meals, clothing and luxuries, while their products were distributed for them, and apparently hardly paid, collectively, the tip that would be received by a waiter for his services to a single family.

The South Atlantic States.

A Dollar Less Six Cents.

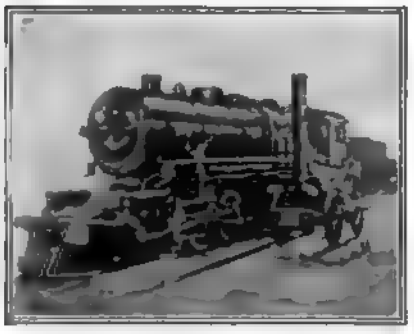
In the South Atlantic group, including Virginia, West Virginia, North Carolina, South Carolina, Georgia and Florida, the greatest amount of profit that the directors of these roads found they could give the stockholders and owners of the Rail Roads from what was left after paying interest, the expenses of operation, the cost of improvements during a quarter of a century, was in 1906, and amounted to the sum of 94 cents a day per mile of track, while in 1894 the stockholders only received 19 cents a day.

Thirty Cents.

The average for the ten years from 1889 to 1898, inclusive, was little more than the proverbial 30 cents a day.

For the five years from 1894 to 1898 it was 25 cents per day, with one cent added for good measure.

The average for 26 years, from 1882 to 1907, was 59 cents a day.



FROM THE "ROCKET" TO A B. & O. MALLET, THE EARLY AND MODERN IRON MONSTERS

THE SOUTHERN ATLANTIC RAILWAYS DID NOT PAY ENOUGH DIVIDENDS PER MILE TO BUY A RAILWAY LUNCH PER DAY

Three Years for a Freight Car.

Had the largest of these sums been put back into the roads, it would have taken at least three years to buy a new freight car, and on the basis of the lowest figures could not, in a whole year, have bought a new switch with its points.

The people in this group of states have been among those most impatient with the capitalization and supposed profits of their Rail Roads, and have felt themselves unfairly dealt with in transportation matters.

It is difficult to see how these Rail Roads could have been operated on a much closer margin, at least so far as profits were

concerned, when all but 59 cents a day went for operating expenses, interest and betterment.

Fair or Unfair Return?

This was the amount of money taken out of this region for a vast public-carrying service rendered, an immense amount of merchandise handled, a largely increased value of property, a considerable saving of time and other benefits which have come to these rapidly growing states and this splendid region during the last quarter of a century.

New Life.

The facts seem to show that these states have gained new life since the prostration of the war, largely through the operation and extension of the Steam Roads, their public carriers, and it is easy to see whose has been the lion's share of the profits.

The New South.

Taking a period of only 20 years, we find the Rail Roads of the South have expanded 92 per cent.

Millions for Construction.

This increase alone is equivalent to the entire Rail Road mileage of the United States at the close of the civil war. This has necessitated hundreds of millions of new money being brought into and expended in the South for the construction of these facilities.

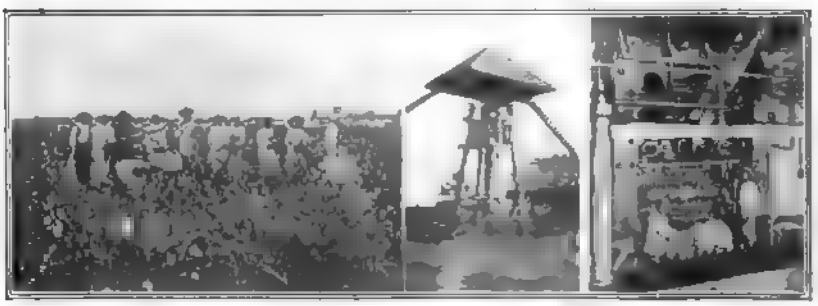
In addition to this the Rail Road industry has been spending and distributing approximately $1,500,000 a week in wages, giving employment to 167,000 men, and supporting say 750,000 people.

Increment to Land Owners.

Assuming that land for ten miles on each side of the 33,347 miles of new Rail Road has been enhanced in value to the extent of only five dollars an acre, this increase, due solely to the introduction of new transportation facilities, amounts to over $2,000,000,000, more than double the entire funded debt of the United States.

Offsetting Civil War's Cost.

This sum, taken in connection with the immense construction accounts, wages and other disbursements, shows an addition of wealth to this section almost as great as its share of the cost of the civil war.



PICKING COTTON. 1860 COTTON COMPRESSES 1910

SOUTH CAROLINA COTTON MILL, LARGEST IN THE WORLD. FROM THE SPINNING WHEEL TO THE FACTORY: AN ILLUSTRATION OF THE DEVELOPMENT OF SOUTHERN INDUSTRY.

The extension of Steam Roads meant the rehabilitation of idle farms and the development of new ones, the exploitation of mineral deposits, the construction of mills, factories, furnaces, etc., throughout the South, so that while in ante-bellum days it was known almost solely as an agricultural region, the manufactures of the region now exceed her agricultural products; thus an absolute revolution has been worked within her.

Yesterday and To-day.

The South has become rich, yet only the surface has been scratched. The following table may give an idea of how the South has developed:

	1880.	1910
Manufacturing capital	$250,000,000	$2,214,000,000
Value of manufactures	450,000,000	2,777,000,000
Farm products	660,000,000	2,550,000,000
Exports	260,000,000	650,000,000

Roosevelt on the South.

President Roosevelt said of the South: "Her growth has exceeded that of the rest of the country, and she is now sharing in every way in its prosperity."

That her resources have increased is best evidenced by the fact that in 20 years her Rail Roads' carrying service has increased 500 per cent and the freight rates have been reduced from an average of a cent and a quarter a ton per mile to less than a half a cent per mile, or from $1.25 to 50 cents per 100 miles.

Yearly Saving $130,000,000.

This increased tonnage alone has been estimated to be worth $4,000,000,000 per annum, and the saving of over $130,000,000 annually in freight rates is certainly a marked one.

In our section, "The Building of Empires," we show at closer range and in more detail the development of the various states, and there it can be seen how better carriage helped in the creation of this property.

The Work of the Steam Road. The growth of the states, in the newer sections, seems to have been largely the result of the work of the Rail Road builder and operator.

This section benefited by the transportation business, which outside capital, in a large measure, has established in their midst, when they had not the resources to build for themselves.

IRON FURNACES, ALA.

Using the Facilities. How greatly these facilities were needed is best evidenced by the extent to which they were used, for in 1907 each Southerner traveled 291 miles over the Rail Roads, and shipped 10 tons of freight a distance of 145 miles.

He made the total yearly Rail Road journeys in about 10 hours at a cost of $7, and his freight consumed in transit an average of four days, being delivered at a transportation cost of $11.31.

Saving the Horse for Work. Without the Steam Roads, the man of this region would find it necessary to make his journeys on horseback or in a light wagon, the Lord showing His willingness by granting good weather. It would, however, take two weeks to reach his destination, at a cost of about $75.

Without them he also would have to hire a wagon and team to transport his products, at a cost of many hundreds of dollars.

The story here set forth of this particular group of states is not an exclusive one, but is true of almost any other group to a greater or lesser degree.

The Needs of To-morrow. The South, to keep step with her past march of progress and prosperity, should have, during the next ten years, 40,000 route miles of new Rail Roads, at an expenditure of $2,500,000,000, largely to be drawn from beyond her own borders.

The South and other groups must get their money in competition, but before it is invested, it would seem but reasonable that assurance be given that capital will not be unfairly treated afterwards.

Why?

Almost every section of the country is advertising for and seeking new capital; each region welcomes with open arms investment in mills and other industries, in many cases exempting them from taxation. Many sections point with pride to the 10 to 20 per cent profit made by their factories, farms, mills, or other industries. It seems difficult to find such encouragement extended to transportation capital, no less important than that invested in any other industry, or why it should be singled out for restrictive legislation.

A writer, in dealing with new Rail Road enterprises in the South, says:

New South's New Life.

"It will then remain for the citizens of the South to recognize, consider fairly and profit by the new splendid highways which individuals by hard work and accumulated savings have created for their benefit."

NEW UNION STATION, BIRMINGHAM. A SPLENDID STRUCTURE.

Northwestern States.

23 Cents a Day.

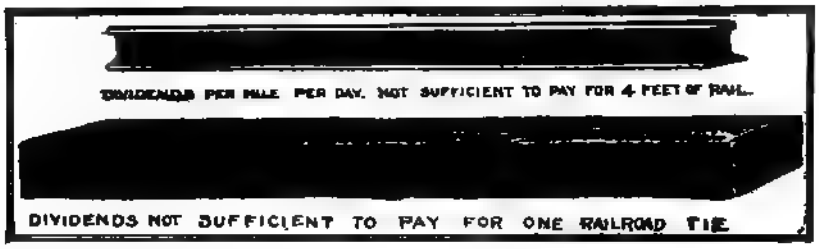
From our great Northwestern group of states, including Iowa, Minnesota, Nebraska, North Dakota, South Dakota, Wyoming, and Montana, the Rail Road owners took out in profits in 1889 the apparently trifling sum of 23 cents per day per mile of Rail Road. The total profit in that year would not have bought a truck for a freight car or upholstered a passenger car.

In 1906 the earnings increased to $4, but between times, from 1886 to 1895, the average was only 11 per cent of this, or 44 cents per mile per day. For the 20 years from 1882 to 1901 it was 87 cents per mile daily.

26-Year Average, $1.64.

For the five years, 1886 to 1890, it was 36 cents, while the average for 26 years was $1.64.

These states are practically highways, as they have much transcontinental and other traffic passing over their Steam Roads. Some years ago it was proven in court that one of these states did not originate 5 per cent of its Rail Road traffic.



RAILWAY DIVIDENDS OF THE NORTHWESTERN AND SOUTHWESTERN STATES, RESPECTIVELY.

Growth and Remuneration.

This group of states has grown from almost nothing to a value of $12,000,000,000, and from a nominal population to one of 7,232,000. In 1850 Iowa and Minnesota had 192,000 and 6,000 inhabitants, respectively, while the five others had no registered population whatever.

The strong, swift carrier which has made a broader existence possible for these states, put them into touch with the rest of the world, carried their burdens and increased their wealth, received over maintenance and expenses an average for 26 years of but $1.64 cents per mile per day.

Southwestern Group of States.

Five Cents a Day Profit.

The Southwestern group includes the states of Kansas, Colorado, New Mexico, Oklahoma, Missouri, Arkansas and Texas.

The investors or stockholders in the Rail Roads of this group profited from these roads to the extent of five cents per day per mile in 1896.

For Ten Years.

For ten years, 1890 to 1899, inclusive, they profited to the extent of 16 cents per day; their profits reached the top notch in 1907, when the Rail Roads were congested with business and everything was working overtime; then there was enough for them to get $1.43.

The minimum profit would have bought less than a dozen ties, while the maximum would not have sufficed for more than a third of a mile of new rails.

The maximum profit is about one-fourth the eight-hour wage of a union mason in New York City, for he gets $5.60 a day. On the

SALAM ROAD BRIDGE ACROSS THE RED RIVER

eight-hour basis the Rail Road's $1.43 dwindles to 48 cents a day, which may be contrasted with the mason's 70 cents an hour.

But, to offset the profits for that year, for the five years, 1892 to 1896, inclusive, they got one cent less than a dime, or nine cents a day, so that equilibrium has been maintained.

The Grand Average.

As a grand average for over a quarter of a century, the owners have received 67 cents per day for the use of their mile of Rail Road.

In New York, a sea-going night-hawk hack, with an attenuated equine driven by a modern robber-baron cabman, may safely be said to make twice as much as this half-a-hundred-thousand-dollar investment.

FILL ON WISCONSIN CENTRAL.

Central Northern Group of States.

In the Region of Wealth.

In the Central Northern group, including the prosperous states of Ohio, Michigan, Indiana, Illinois and Wisconsin, among the younger children of the republic, we find some interesting if not startling facts regarding their prosperity.

In 1850, 50 years ago, there were only 4,500,000 inhabitants and 1,200 miles of Rail Road in this great group of states. To-day the population has increased to 18,000,000. To meet the needs of these millions, over 100,000 miles of Rail Road track have been built.

Waterways Inadequate.

The states all border on the nation's greatest inland waterway, the Great Lakes. The states also are traversed by the mighty Mississippi and the broad Ohio and by many of their tributaries.

The inadequacy of even such a bountiful provision of natural waterways to handle the widespread trade and commerce of this group of states is demonstrated by the fact that so many miles of Rail Road have been constructed, which, in busy years, are used well toward their full freight capacity.

Let us see what return the people who created this vast system of roads and their artificial highways, and who are conducting them as a business, have been and are getting for their enterprise and capital.

The Iron Ore Traffic.

This region handles a large part of the vast traffic in iron ore, coming from Minnesota, Michigan and Wisconsin, which, landing at lake ports, goes over the Rail Roads to the furnaces of Pittsburgh and the Chenango and Lehigh Valleys, to be converted into iron.

This is foreign traffic to this group, though originating partly in it, and although their manufacturing industries and people greatly benefit by their transportation and transformation.

Paid for by Outsiders.

The Rail Way charges on this business, however, are not paid by the citizens of these states except for what they use themselves, but by the citizens of the states where the manufactured product is eventually consumed.

Foreign grain, the coal and fuel to heat the Northwestern states and other traffic, also bear a large part of the Rail Road expense, and thus others help to pay the carrier, so that the profits received by those in the Rail Road business in these states for providing the expensive Rail Road facilities, equal to more than half the entire active Rail Road mileage of all Europe, do not come entirely from the pockets of the inhabitants of the Central Northern group; in fact, they contribute probably not more than 50 per cent.

GASCONADE BRIDGE, ROCK ISLAND SYSTEM

THE NORTH CENTRAL RAIL WAYS DID NOT PAY DIVIDENDS ENOUGH TO BUY A YARD OF PLUSH TO RECOVER A CAR SEAT.

Less Profit on More Business.

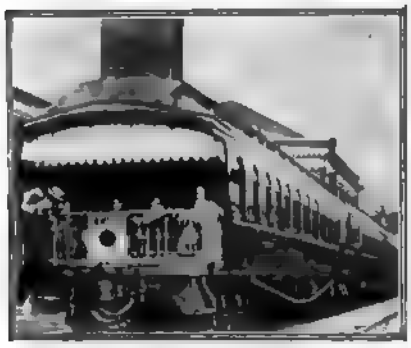
In 1889 the Rail Way owners received a return of only $1.03 a day per mile; and in 1882, the first year of the quarter century with which we have been dealing, they got a return of $1.96 per day, the largest return of the entire period; they have consequently been earning less since then for doing a larger amount of work.

For the five years from 1894 to 1898, inclusive, they received $1.09 a day, net, for operating a mile of Rail Road, and for the ten years, 1889 to 1898, inclusive, their net was $1.14 a day.

For the twenty years from 1882 to 1901 they received $1.34. The grand average for 26 years was $1.42. The average yearly profit would not have put in a good-sized culvert if the money had been diverted to the property instead of paying a dividend.

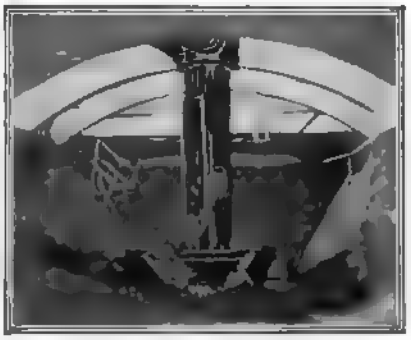
Minimum for a Maximum.

Upon visiting the busy manufacturing centers of Cleveland, Cincinnati, Toledo, Chicago, Milwaukee, Columbus, Indianapolis, Detroit, and hundreds of others, many of which owe their present position to the wonderful influence of this industry; as one sees train after train rolling in and out in an almost endless procession over double-tracked lines of rails, and learns that for the maintenance, upkeep, etc., of each mile of these vast properties, less is made than a man might reasonably expect to and does earn ordinarily with a wagon and a pair of horses, the returns for all this labor do not appear too lavish In fact, the average amount converted into dividends would not have hired an extra section hand or laborer for each mile of track.



THE PIAZZA OF AN OBSERVATION CAR.

THE ARM OF A GREAT UNLOADER IN HOLD OF A VESSEL.



Pacific States.

Much for Little.

The Pacific group, comprising Washington, Oregon, Idaho, California, Arizona, Nevada and Utah, is among those who have received the greatest service for the least profit. In the flush times of 1907 the Rail Road owners got $2.51 a day for owning and operating a mile of Rail Road, but in 1904 they got less than one cent a day on the average for each of the 13,000 miles operated, or $3.33 a year per mile.

Less Than One Cent a Day.

In other words, for a whole year's work of the 13,000 miles of road at that time in operation,—enough to make four transcontinental lines from coast to coast, and another a third of the way across,—the owners received in toto the sum of only $40,000. Had this sum been diverted to the road it would hardly have bought a spike a day to help keep each mile of road in repair.

For ten years, 1894 to 1903, inclusive, they received a baker's dozen of pennies, or 13 cents a day, as their profits.

For five years, 1894 to 1898, inclusive, the stockholders received eight cents per day for the use of their Rail Roads, which is hardly enough to satisfy a bell boy for bringing a pitcher of water.

67 Cents a Day the Average.

For the period of 26 years an average of two-thirds of a dollar, or 67 cents a day, was earned for furnishing transportation for man and his produce.

Less money has been made in some years by all these Rail Roads combined than probably many a lumber mill, big wheat farm, fruit orchard, salmon cannery, mine operation or numerous other individual enterprises received in net profits in 12 months; probably less than the increase in value within a few years, of many a single block of ground 200 feet square, such as there are hundreds and hundreds in the big cities along the coast, largely dependent upon the Rail Roads.

DIVIDENDS PER MILE INSUFFICIENT TO HIRE AN EXTRA SECTION HAND.

Average Stockholder's Profit in the United States.

What the Owner Gets.

The story of actual profits in dividends to shareholders of Rail Roads for the entire United States, from carefully compiled official statistics, covering three years more than a quarter of a century, may be found below.

During this period of 28 years the average Rail Road shareholder throughout the country sometimes received, for providing a mile of Rail Way for other people to use, less than a dollar a day; the highest was after the boom of 1907, when he received $2.35 per day. For five years, from 1894 to 1898, inclusive, he received 97 cents per day; for the ten years from 1889 to 1898, $1.04.

Average for 26 Years, $1.43.

The average for the 26 years ending with 1907 was $1.43 per day. In other words, the man owning all the stock in a mile of Rail Road, and doing a vast work for the public; could hardly have hired an unskilled laborer to do his chores from his net return.

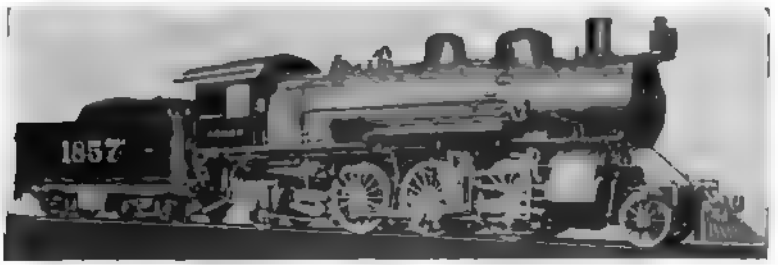
He could not have hired a buggy or hack for his own use for two hours a day, or gotten more than three square meals a day at a country hotel. The reader may determine for himself whether there can be any objection to allowing the owners of Rail Roads in the United States to receive such returns as recited, less

profit than is made on the sale of a two-cent newspaper having been returned in the Pacific States each day during one year.

A Cigar a Day. Is it too much to make less than a cigar a day, as happened in several groups for years? Is it even too much that they make less than 50 cents a day, less than a man with a peanut stand, or an apple vender, lines of business done on practically no capital, and beyond giving a living to the man in the business, rendering but small public service?

Try It for Yourself. The reader can ask himself how he would like to establish such a business, and not receive net for his work more than a fourth to a third of the wages of a skilled mechanic, mason, carpenter or painter. He can determine for himself if such profits are reasonable or unreasonable; if they are sufficient and give margin enough for safety beyond the risks of this business.

The report of the Interstate Commerce Commission shows that Rail Road building, in the last two years, has only kept pace with the population, while we know, from experience, that traffic grows three times as fast as the population.



THE PACIFIC RAILWAYS EARNED ONLY COAL ENOUGH TO RUN A LOCOMOTIVE FIFTEEN MINUTES.

Profits at Close Range.

Conclusion. The simplified figures set before you here, in perhaps a new light, may bring you closely enough in touch with the facts for you to realize their value, and enable you to judge whether the Steam Roads and those engaged in the Rail Road industry and business, have charged or are receiving too much or too little profit for the services rendered.

Who else would do the same amount of work, handle the same gross amount of business in dollars, in people and in weight, take the same risks and make so great an investment for an equal compensation? It is purely a business proposition.

Where the Inducement? If it does not attract you, is it reasonable to believe that there can be much attraction in it for investors?

The tendency of the people toward the feeling that our transportation companies have been receiving too much, may be modified, if they will consider for themselves the advice of former Governor, now Supreme Court Justice Hughes, who says:

A Governor's Advice.

"The way to deal with a matter is first to understand it. We should understand our Rail Roads before we attempt to deal with them."

It is hoped that this simplified explanation may aid in bringing about such an end.

THE AVERAGE DAILY NET RETURNS TO RAILROAD STOCKHOLDERS FROM FREIGHT AND PASSENGER ENGINES AND CARS, AND FROM THE ROAD.

Average daily net return on a freight car.....	$.05
Average daily net return on a passenger car.....	.40
Average daily net return on a freight locomotive.....	.87
Average daily net return on a passenger locomotive.....	1.20
Average daily net return on a mile of track (including buildings)	1.71

The Interstate Commerce Commission has set forth the cost of each of the various items mentioned above. The results obtained are reached by the simple means of allotting to each item the same percentage of the total dividends, as the cost of that item bears to the total cost of the railways.

In our "Analysis of a Rail Road," we change the Rail Road, its cost, work and profits, from a collectively vast industry to what it no less positively is, an aggregation of mile-long units. Even then we find the Rail Road still to be composed of many parts, but in this form, at least, its workings are more easily understood.

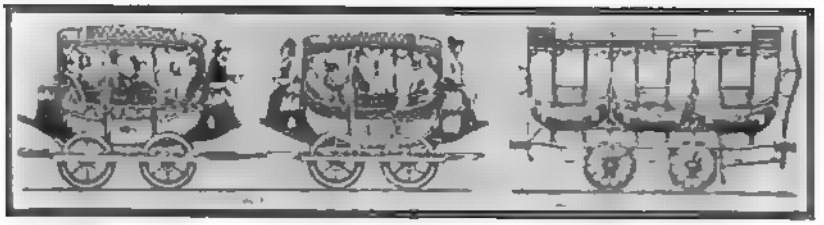
We will continue this process, however, and find the earnings per unit of the iron horse, the Rail Way freight wagon, the passenger coach and that of the road on which they run.

Each freight car, for hauling 268 tons one mile, brought a net return to the owners of five and one-tenth cents per day. The passenger car brought in net to the stockholders an average of forty and nine-tenths cents per day, for rendering the great service of hauling 1,759 passengers one mile.

Much Work, Small Profit.

The average net return on the freight locomotive, worth from $12,000 to $16,000, which hauled 17,777 tons a mile each day, was only eighty-seven cents, while the average return on a passenger locomotive costing no less than $15,000, which hauled 6,043 passengers a mile daily, was but one dollar and twenty cents.

Finally we come to the road itself, with its many necessary accessories, its share of yards, passenger stations, round houses, engine houses, machine shops, signal system, water tanks, bridges, tunnels, and all the other appurtenances belonging to a Rail Road, apart from its rolling stock and other movable appurtenances, worth on the average about $30,000. The toll paid on the average mile of Rail Road over which 356 passengers and 1,970 tons of freight were carried, and which was better, more substantially, more expensively and more completely equipped than the finest turnpike, was a net sum of only one dollar and seventy-one cents.



MOHAWK AND HUDSON CAR, 1831 CAMDEN & AMBOY CAR, 1831.

SECTION XV.

THE RICH AND THE POOR RAIL ROADS.

Do You Know?

Contrary to usual belief, although the Rail Roads are great contributors to the progress and prosperity of the nation, prosperity is not, nor has it always been, theirs. It may shock many of us to be told that there are Rail Roads that are "hard up," and others that are desperately poor. The operation of a Rail Road frequently presents as many financial difficulties as the maintenance of a family; the same relative conditions apply in each case in the necessity to make both ends meet.

The prosperity of the Rail Road, as of the laboring man, depends upon whether there is much or little work, whether wages are good or bad for the service rendered, and expenses moderate or high.

For the Rainy Day.

No one will question that the wage earner should guard against illness, against accident, and against other unexpected expenses by putting something aside for the proverbial rainy day. The Rail Road has to guard against like contingencies, only in very much larger proportions.

When a Rail Road "gets behind," it is almost as difficult for it to regain good financial standing as for an individual in that predicament. If business is so bad that it has been unable to pay its bills and meet the interest on its mortgages promptly, its credit becomes poor, and its landlord, the mortgagee, importunate for the rent of his money.

Troubles of this nature double the difficulty of securing the funds necessary for rehabilitation, and sometimes even for operation. It may be necessary to pledge the road's income or wages as a last resort, just as a wage earner occasionally obtains an advance upon his salary.

Like Private Individuals.

Many Rail Road presidents and boards of directors have as anxious periods about how they may make ends meet and weather financial storms as do the smallest householders; and yet such efforts have failed in scores and hundreds of cases.

Some Rail Roads have never made more than a bare living. Others have had to borrow money time after time so that they might exist; the debts thus contracted have frequently been scaled down to a fraction of the original sum when the return was made. Many roads have had such hard times that interest accumulated year upon year, until its amount represented well nigh as much as the principal of the original loan.

Scarcity of Profits.

Few industries, probably, have so large a percentage of non-profitable concerns. Of the 173 Rail Roads listed on the New York Stock Exchange, and the 13 unlisted, only 105, or 56 per cent, pay dividends. If this percentage is an indication of general conditions, it is easy to see that a large number of the 2,196 Rail Roads, big and little, reporting to the Interstate Commerce Commission, must be in poor financial condition. We do know that about a third of the Rail Way stocks of the country pay no dividends.

SCULPTURES ILLUSTRATING COMMERCE AND TRADE OVER FACADE, STOCK EXCHANGE, NEW YORK

As a comment upon Rail Road operation, we may paraphrase and say truthfully that sometimes it is "millions for operation and maintenance, but not one cent for dividends."

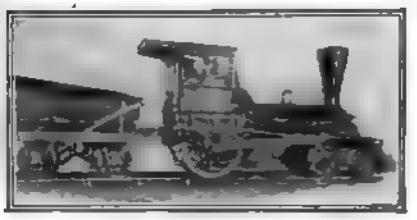
Economizing Difficult.

The difficulties of the average individual and of the Rail Road, as we have recited, are practically the same; but there is this difference—in the Rail Road's case the troubles are greater. Rail Roads cannot economize by taking cheaper living quarters or doing their

own work; they must always buy good food for their iron horses; they have to pay wages to drivers, hostlers, trackmen, station agents, etc., and they must constantly repair and keep up their properties.

THE "PIONEER," C. & N. W., 1848.

MICHIGAN CENTRAL CAR, 1844



Receiverships.

A Stormy History. The prosperity and progress of our Rail Roads have received many severe setbacks through the numerous receiverships which they have passed through. In fact, in the early days receiverships so frequently followed the organization of Rail Roads that they seemed almost a natural consequence of such an undertaking. Of the thousands of Rail Roads constructed, those which have not been in the hands of the receiver or in financial difficulties are as rare almost as the far-famed dodo.

The operation of a Rail Road or transportation company is a business. Therefore, it is not surprising that it is as subject to this commercial vicissitude as any other mercantile enterprise, and perhaps more so.

The Cause of Failures. A cardinal cause of Rail Road receiverships has been, as in almost every other industry, lack of capital to see them through the period of the development of business, to put them on a profitable basis. In almost as many cases a contributing cause has been insufficient business, the latter frequently due to the Rail Roads having opened up unsettled districts which did not develop rapidly enough to nurture and support the Rail Roads in their infancy. Again trouble and disaster have often followed rate wars among the Rail Roads.

As in many commercial enterprises, there have been failures resulting from over-extension in good times, from being caught in times of stress without adequate resources and from bad management. Flagrant over-capitalization has also been a cause of Rail Road receiverships.

Like Other Business.

Where existing business justified extension of the lines, or where long-headed judgment built them in advance of development which materialized promptly, the Rail Roads have succeeded just as would any other business enterprise. The great difficulty and almost impossible task lies in discriminating beforehand between the successful and the unsuccessful enterprise.

The Requiem.

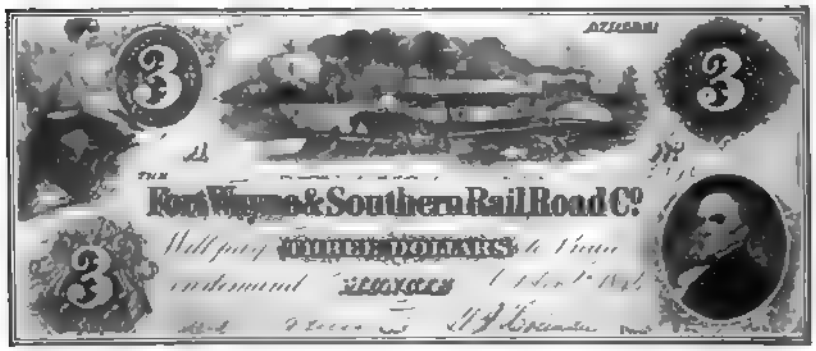
When a road is on the verge of financial starvation, bankruptcy and dissolution, there is held around the invalid's bedside a gathering of creditors and others interested, who there bow to the inevitable and say "good-bye" to at least a part of their money or its earning capacity, for a time, at any rate. Sometimes those interested advance additional funds, hoping for a breathing spell which may result in at least partial recovery or rehabilitation.

These waifs or sick brethren sometimes have been adopted by others, after they have gone through a legal and financial purging process.

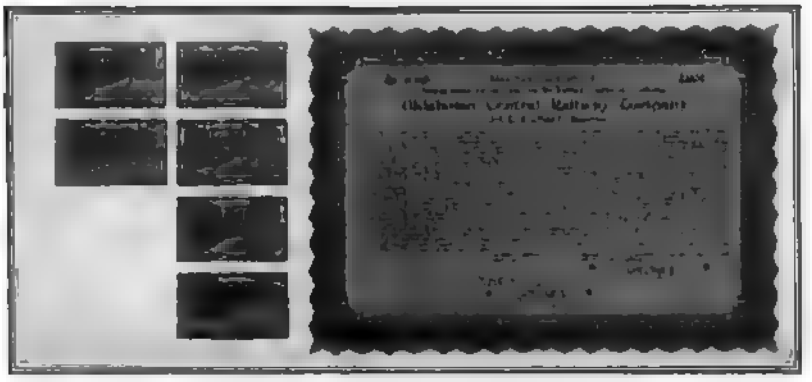
Going, Gone.

When the funds necessary to put the property on its financial feet cannot be obtained, the Rail Road is frequently put up for sale at auction. The price obtained for Rail Road properties at such forced sales usually is less than can be secured if the property is conserved and disposed of under more favorable conditions. As a rule, however, there is no outside bidder. They usually have to be bought in for account of the mortgage or bondholders and creditors.

In order to conserve the interests of mortgagees, stockholders, and creditors, the plan was long ago adopted of appealing to the courts to appoint a receiver—who is practically a legal guardian or trustee—to take charge of the property and to operate it during the period of rehabilitation. Sometimes a number of men are appointed to manage the property. The receiver is required by the court to give an adequate bond to insure the faithful performance of his duties.



SCRIPT OF THE FORT WAYNE & SOUTHERN RAILWAY



RECEIVER'S CERTIFICATE OF A RAILROAD RECENTLY COMPLETED.

Receiver's Certificates. In order to raise the money necessary to keep the road in operation, the receiver is frequently allowed to borrow money or issue "receiver's certificates." The receiver's certificates, which are often for large sums, are a first lien on the property. Consequently, they lessen the value of the mortgage and all other securities temporarily, but they have frequently been the means of putting properties back on their feet, and on a paying basis, to the benefit of the stockholder, bondholder and creditor, and of the community through which they pass.

Receiverships are seldom brought about by stockholders; usually it is the bondholders or creditors who act. The explanation lies in the superior rights of the bondholder, and in the peculiar relation he occupies toward the property. One could as soon imagine a man bringing about the foreclosure of a mortgage and having his own home sold over his head as the stockholder voluntarily applying for a receiver for his road.

Bondholders' Rights. It is possible in some states to put a large amount of stock on a transportation company and but a small amount in bonds, and yet, should the interest on the small amount of bonds be defaulted, though no dividend may have been paid on the stock for years, the bondholders could take possession of the company, and the stockholders might be wiped out.

Stockholders' Lack of Rights The stockholders, as a rule, have no incentive to bring about a foreclosure. While the equity of the property belongs to them, it is subject and junior to the mortgage of the bondholder. Frequently, when the crisis comes, the stock is entirely wiped out by foreclosure, just as the mortgagee on a piece of real estate may take it in and eject the former owner entirely. At other times, preferred stock is issued, for the purpose of raising money to keep the property going, which receives returns before the common stock, naturally causing the latter to be lessened in value.

One reason why Rail Roads frequently issue new bonds after

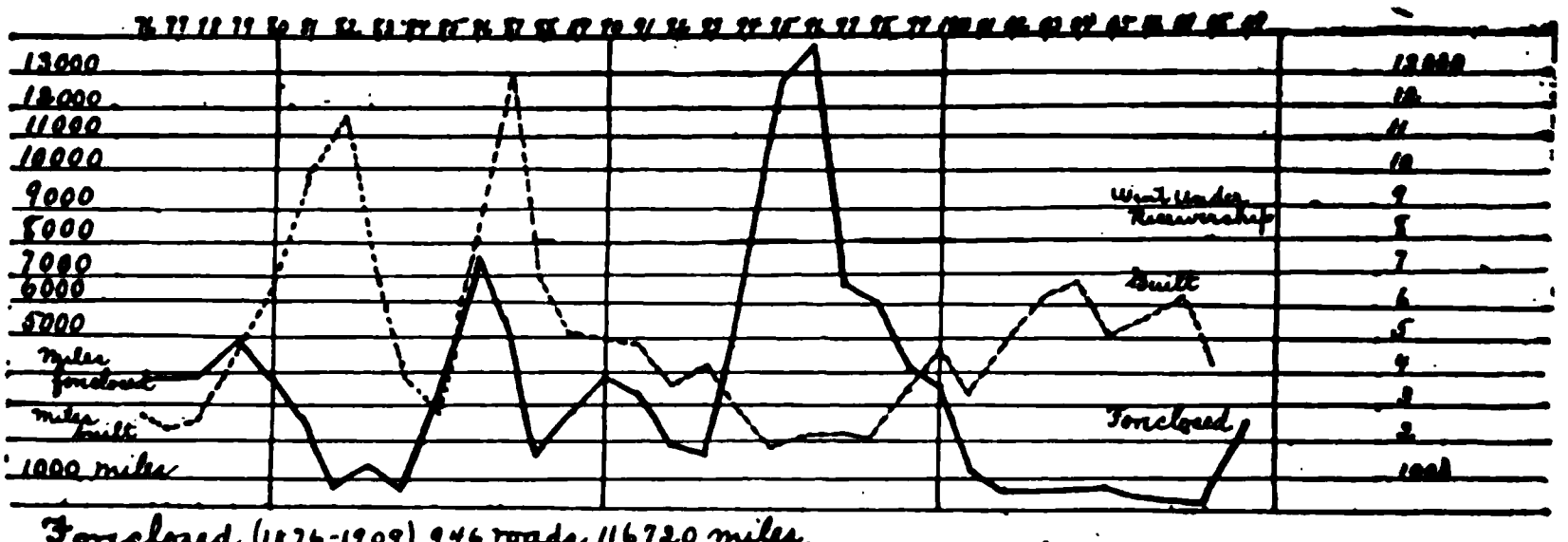
reorganization, although their funded debt is increased, is that the Rail Road merchants not only want working capital for the operation of their business, but as honorable business men they consider it necessary to pay the interest on the debt contracted, including the interest past due on their bonds or mortgage. In fact, the mortgagee usually demands this, just as a mortgagee upon a piece of real estate who has to bring about a foreclosure, obtains judgment for principal as well as accrued interest. In many cases bonds and interest are scaled down, sometimes in a tremendous degree.

THE UPS AND DOWNS OF RAIL ROADING.

Reductions in Rates. The Cycles of Rail Way Building.

The First Storm.

In 1830 there were in the United States but 23 miles of Rail Roads, over most of which horse-drawn cars were operated. Only seven years later, when our Rail Road system was hardly graduated from triangular trousers and catnip tea, the initial cost of construction had made such a drain upon the finances and savings of the nation, a number of roads having been injudiciously located, that in several of the Southern and Western states the lines were actually abandoned, notwithstanding large sums had been expended on them.



A DIAGRAM SHOWING THE RELATIVE BUILDING AND BANKRUPTCY OF RAIL WAYS.

Many other Rail Road enterprises, undertaken in 1834 and 1836, remained in abeyance, and did not see real light until early in the '40's, after the turn of the tide.

Incubator Rail Roads.

Frederick Carter, in "When Rail Roads Were New," aptly calls many of the Roads chartered at this time "incubator Rail Roads," as they were hatched wholesale, although many died in the "brooder." Numbers of them got no further than the charter age, while others reached the stage where stocks and bonds were printed and offered for sale, though buyers of them were frequently conspicuous by their absence.

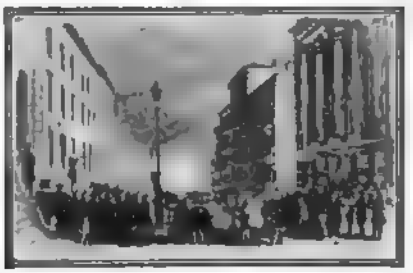
The Galena & Chicago Union, the parent and predecessor of the Chicago & Northwestern, is a typical illustration of what occurred in that period. In 1836, the legislature of Illinois granted

a special charter to this company to construct a Rail Road across the prairie country toward the Mississippi. But because of the financial panic of 1837, it was 10 years before actual construction began.

Fate of Pioneers.

The forerunner of the Michigan Central, the Detroit & St. Joseph, chartered about the same time as the Galena & Chicago Union, suffered the same setback.

A similar thing occurred to the Erie & Kalamazoo, now part of the Lake Shore. Although the state of Michigan came to that road's rescue, it was not until 1846 that 144 miles to Kalamazoo were completed. Such was the situation and condition of the property, however, that the people who bought it later on scarcely secured possession before they had to go down into their pockets for additional funds for extension, rehabilitation and equipment.



WALL STREET, SUSPENSION DAY, OCTOBER 14, 1857.

The Second Cyclone.

In 1857 came the next serious financial storm. Meantime Rail Road building in many quarters of the Middle West had proceeded with great rapidity. But the financial stringency put the brakes on construction, and many lines became bankrupt.

In this, as in recurring periods of business depression, the sound Rail Roads, and those which had not overbuilt, acquired the stocks and properties of the bankrupts at prices which made them attractive to their purchasers, just as merchants buy the wares and stocks of their unfortunate competitors.

The Civil War.

The effects of the financial depression of '57 had not been overcome before the civil war began, and in the five years between 1860 and 1865 only 3,303 miles of Rail Road were built in the United States. The mileage of 1865 was only about 12 per cent of to-day's mileage.

The war left its legacy of inflated currency and national debt, which paved the highway for the "Black Friday" of 1873. Tremendous activity had been displayed in the intervening eight years, the Rail Road mileage increasing from 30,626 miles in 1865 to 70,653 miles in 1873. In other words, the mileage more than doubled in eight years.

That there was over-building and over-competition in this period is demonstrated by the following: In 1860 there were 1,026 inhabitants for each mile of Rail Road; in 1870 there were 730; but by 1873, the number had fallen to 590. Poor's Manual says it was demonstrated that at this period it took at least 850 people to support a mile of Rail Road.

Earnings Decreased.

Even more positive proof of over-building is found in the fact that the gross income per mile dropped from $8,116 in 1872 to $6,381 in 1877, a decrease of more than one dollar in each five of the gross earnings per mile.

The large receipts previous to 1871 had over-stimulated construction, and when the crash came scores of Rail Roads, as well as other mercantile institutions, became bankrupt.

It took nearly 30 years, or until 1901, for the gross receipts of the Rail Roads to recover to the level at which they stood in 1871.

ST. PAUL IN 1861.

ANALYZING THE FAILURES.

The Reason.

An exhaustive examination into the reasons which brought the principal systems into the hands of receivers in 1874, discloses that their difficulties were produced largely from either of two causes. The roads were either yet in the midst of construction and required the raising of large sums before they could be completed, or they had insufficient income from operation, because of the considerable reductions of rates or from some variation of these causes. Many became antiquated, and practically had to be rebuilt or re-equipped.

Their difficulties certainly were not due to over-capitalization so far as the stock was concerned, proved by the fact that the roads which went to the wall did not pay dividends, as they did not even earn enough to pay interest on their mortgages. Therefore, their stock capitalization, whether small or large, had nothing to do with the disasters which befell them.

A Road to Nowhere.

The Northern Pacific was one of the roads which suffered from over-confidence in the future of the Northwest. With 555 miles of line, which started at the Mississippi River and "ran to nowhere," it had opened a territory bigger than all New England. To pay for

the road, $30,780,000 in 6 per cent bonds had been issued, but these had to be sold at such a discount that they realized only $22,700,000 in real money. The interest on the actual capital, consequently, would have been 7.3 per cent on the money received. But even this was at a low rate of interest, for farm and other mortgages in that section commanded 12 to 15 per cent in those days.

In 1874 the gross earnings of the Northern Pacific were $365,000, only $22,000 more than the cost of turning the wheels, therefore leaving for the payment of interest little more than one dollar on the hundred of the interest due on its funded debt, allowing nothing for upkeep, betterments, or dividends.

Averting Disaster. It was only through receivership and reorganization, in which the bondholders took preferred stock for their mortgage, principal and interest, that the construction of this great Rail Road and the opening up of a new empire could be continued. In other words, the mortgagees gave up their mortgage and in its place took securities of uncertain standing and questionable value, trusting to the development of time to bring back, possibly, principal and interest.

Perseverance. Little by little, as the country filled with immigrants, the Rail Road officers persevered in their efforts to bring about settlement, to find goods to be transported, to open up markets for products, etc. The owners had to be patient. But as a result they have to-day a fine, modern Rail Road, through a splendid country, populated by busy, prosperous people, who are efficiently served by the line. An average annual dividend of approximately 1 per cent, however, is all that has been paid on its stock in its 40 years of existence.

THE GATEWAY OF THE NATION EMIGRANTS' LANDING PLACE, NEW YORK

Fatal Cheapness. Contrary to the general belief, which ascribes the financial troubles of the Erie to stock manipulation, even this Rail Road failed for the reason that from 1868 to 1875 both passenger and freight rates were reduced practically 50 per cent What enterprise do we know that can stand a reduction of half its income, while doing business as

large in volume as formerly and under an equal expense, without feeling gravely detrimental effects?

Paid for the Privilege.

Similar conditions prevailed throughout the country. In 1876 over 6,000,000 more tons of freight were moved by the Rail Roads than in the previous year for nearly $3,000,000 less in money return. In other words, the Rail Roads paid $3,000,000 for the privilege of moving 6,000,000 tons of freight for nothing.

This is reminiscent of the old-time rivalries among various stage lines and steamboat companies, which in some cases, it is said, reduced rates until, after the fare was nothing, a free dinner and a quarter of a dollar were given to each passenger.

THE ATTEMPT OF A GEORGIAN RAILWAY TO WEATHER THE STORM OF 1874.

Reductions in Rates.

Rate Watering.

In 1876 the Rail Roads received $132,000,000 less than they would have received at the rates of 1871 for the same service. As Slason Thompson puts it, "It was the watering of rates, and not of the capital of Rail Roads, that was the most potent cause of Rail Road receivership."

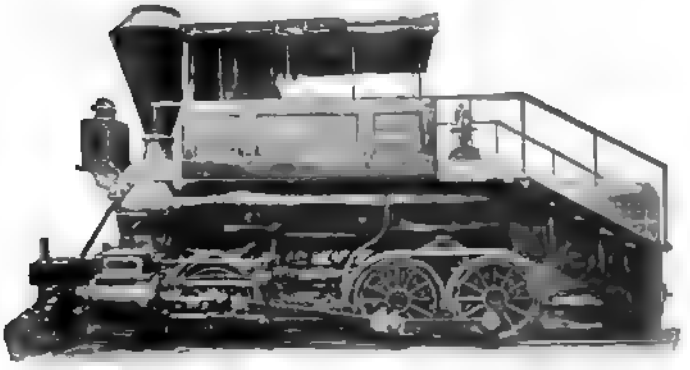
In three years from 1874 to 1877 Rail Roads with a total capitalization of $1,141,000,000, nearly one-fourth of the then capitalization of American Rail Roads, went by the board. These failures involved two miles of every seven in the country.

Cost and Capital.

Notwithstanding the popular impression, figures show that not much water could previously have entered into Rail Road capitalization. The construction of these 20,714 miles of roads cost $1,032,784,000, or within $109,000,000 of the total capitalization, the face value of which included the large reductions at which, in many cases, bonds were sold to obtain funds, as well as the equity and investment of stockholders, which was frequently wiped out in reorganization.

Recovery.

It was not until 1880 that Rail Road earnings showed any recovery from the low ebb that followed the depression. Nevertheless, so urgent had been the demands of our growing, stretching giant of a nation for



A SIX WHEEL CAMEL-BACK LOCOMOTIVE. AN INTERESTING TYPE.

new transportation facilities, that the gross earnings of Rail Roads had increased from $520,466,074 to $613,733,000 in the seven years since 1873, although the earnings per mile were below those of 1871.

Meatless Bones.

From 1872 to 1880 Rail Road dividends dropped from 3.9 per cent to about 2.75 per cent; in 1871 they were 25 per cent higher than 10 years later, when they were 3.20 per cent.

After 1880 the demand in many sections for steam transportation, accompanied by many grants of land freely offered, together with the promising territory which was opened up in every direction, induced another era of feverish Rail Road building. From 1880 to 1883, 31,000 miles were added to the mileage of the United States, an increase of 40 per cent over the mileage of 1879.

Slight Increases.

These extraordinary figures in new construction were accompanied by an average increase of capitalization of $5,091 per mile, so that in 1883 the gross capitalization of the American roads was $64,768 per route mile. But it should also be remembered that better roads and heavier rolling stock were then required and in use. Much of this increase of capital was through a technical duplication of the securities, but it was estimated that $550,000,000 was either wholly fictitious or represented paper profits and unsound financiering.

A POWERFUL TEN-WHEEL YARD LOCOMOTIVE.

Injudicious Building.

The building of the West Shore parallel with the New York Central, and the construction of the Nickel Plate practically for purposes of blackmail upon the Lake Shore, which resulted, as was intended, in the former being bought out by the latter, were features and examples of the conditions of those times.

The receivership of the West Shore was forced by the firm attitude of the New York Central, and much water was bailed out in the process, which occurred almost before the West Shore had gotten into operation.

Another Gale.

A storm came again in 1884, and not less than 48 companies, operating 15,359 miles of road, involving a capitalization of $708,594,000, went into the hands of receivers. A list of the wrecked roads, notwithstanding many omissions, showed that they actually cost $612,500,000; consequently there was only little more than 15 per cent of water in this batch of Rail Roads that went through the wringer.

A HIGH CLASS PASSENGER LOCOMOTIVE OF A GENERATION AGO.

By 1887 much water had been pretty effectively squeezed out of American Rail Road securities through readjustment and reorganizations. They had been hung on the clothes-lines of the courts and dried out so effectively by the winds of adversity that they had practically shrunk to their natural size.

Between 1877 and 1887 there was a further general reduction in rates of fully 25 per cent.

Overbuilding.

Rising Building Tide.

From 1887 to 1892 there was another rise in the tide of Rail Road building. During that period 30 per cent, or 40,803 miles of Rail Road, were added to the mileage of the country; it is said that almost as many miles of side-tracks and subsidiary tracks were laid during this era.

That the extent of this mileage may be appreciated, it is necessary to consider that the increase of the mileage of these subsidiary tracks, not usually considered in counting the miles of Rail Road lines, in the half decade was 25 per cent in excess of the entire mileage constructed during the first 40 years of Rail Road building in the United States.

Growth and Reductions.

By 1892 the total capitalization had increased to $9,686,146,813, including $1,400,000,000 of duplicated securities. That this expansion was not out of proportion to the expansion of business is proved by the fact that in the four years from 1888 to 1892 passenger traffic increased 30 per cent and freight traffic 44 per cent.

It seems to have been justly said by Slason Thompson that increases as large as these justified an addition of 30 per cent to the Rail Road mileage, especially as the gross capitalization increase was only 25 per cent.

During this period, however, as in the previous ones, the public received its transportation service at considerable reductions from the rates which had been ruling in previous years.

On the basis of the rates ruling in 1888, the freight charges for the year 1892 were $111,000,000 less.

The Catastrophe.

The panic of 1893 was not produced by the over-capitalization of our Rail Roads, but by the scramble for the meager and reduced volume of traffic caused by the depression leading up to that period. There had been entirely inadequate freight business to go around, so 20 or more Rail Roads went by the board, despite the large passenger traffic, stimulated by the World's Fair of 1893.

The reduction in rates to which the failures were also due to a considerable extent, caused in 1894 a deficit of nearly $46,000,000, where, if the rates of 1888 had been maintained, there should have been a surplus of $109,000,000.

Getting Rich Slowly.

The holder of some shares in a Rail Road in Iowa wrote a friend in 1885 that each share had cost him $100 cash in 1857, and had made no return until 1880. Just now this road serves as a link in the main line of the Chicago, Burlington & Quincy Rail Road. The original stockholder, if still alive, reckoning interest on his money, would find that each share cost him $400, as to this day he has never at any time received a fair return on his original investment.

The Fortunes Involved.

While a large number of the roads were taken out of the hands of the courts through reorganization, the following partly shows how great has been the killing of capital in Rail Road receiverships:

Foreclosures.

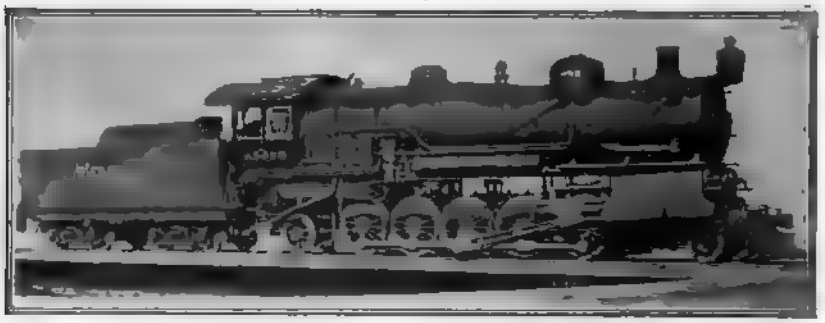
During 1885, 1886 and 1887, 93 roads, with a mileage of 15,885, and a capitalization of almost a billion dollars—to be exact, $999,972,000—suffered foreclosure sales.

How vast were the amounts involved in the receiverships dur-

ing different periods may be appreciated when we realize that in the memorable year of 1893 Rail Roads with a capitalization of $1,996,195,011 were placed in receivers' hands; the total for the period from 1884 to 1899 was but a little less than five and a half billion dollars, six times the entire present national debt.

Of this amount roads with a capitalization of $4,866,138,619 were sold under foreclosure.

A single road, the Atchison, Topeka & Santa Fe, which went into receivership in 1893, had 4,438 miles of road, and a capitalization of $330,082,000.



A MODERN A. T. & S. F LOCOMOTIVE.
THE ATCHISON, TOPEKA & SANTA FE, WITH 4,438 MILES OF TRACK, WENT INTO RECEIVERSHIP IN 1890.

Only One Reason.

The first and principal cause of most of the receiverships, is the advantage which was the public's: the decrease of Rail Road rates. For the entire country, between 1884 and 1894, the rates per mile declined from 2.36 to 1.98 cents per passenger, and on freight from 1.13 to 0.86 cents per ton—causing the Rail Roads, on the basis of the traffic of 1894, a loss or decrease of no less than $299,775,826, a sum sufficient to have insured the solvency of every road in the United States in that disastrous year.

Many Rail Road Bankrupts.

But Rail Road troubles of this kind are not to be written of entirely in the past tense. In 1908 8,009 miles of Rail Roads, including such systems as the Norfolk & Southern, Seaboard Air Line, Chicago Great Western, International & Great Northern, and Western Maryland, with a total capital of approximately $600,000,000, more than the aggregate capitalization of all the Rail Roads in the United States up to 1855, went into the hands of receivers, or into bankruptcy. The Erie was only saved from foreclosure and receivership by outside assistance, which advanced the interest on its bonds, that the road at the time was not earning.

Run at a Loss.

The following letter from a receiver of a number of the roads which became bankrupt in 1908, written to the Bureau of American Rail Roads, is typical of many replies received to requests for statistics of operation for that year:

Dear Sir:—This will acknowledge receipt of your favor of December 10th, addressed to the President of the ----

This line being bankrupt, and its earnings about 40 per cent of its expenses for the year ending June 30, 1908, no attempt has been made to compile the statistics required by you.

Respectfully,

.....Receiver.

The Search for the Dividend.

That the prosperity and profits of our Rail Roads have not been on the same increasing scale as those of the country at large, seems to be conclusively proven by the story of their profits.

In 1872 the average profit paid on stock was 3.91 per cent, after which it decreased almost steadily. In 1878 it reached 2.34 per cent, while in 1885 it was only 2 per cent. There was a slight recovery, but the rate reached 1.77 in 1888, and its low level of 1.62 in 1897. Dividends on net capital stock for 1909 were about 4 per cent.

Years of Rail Road Service below Cost.

Ups and Downs.

We have dealt with the ups and down of Rail Roads. We have found that there have been periods in the history of almost every Rail Road in the United States when receipts were insufficient to meet operating expenses and interest charges; that there have been times when it became bankrupt, and in the parlance of to-day was "down and out."

At such times the Rail Road merchant was doing that which so many of us are anxious to have our neighbor do, but which we are so loath to do ourselves; he was giving service below cost—something for nothing.

Crash!

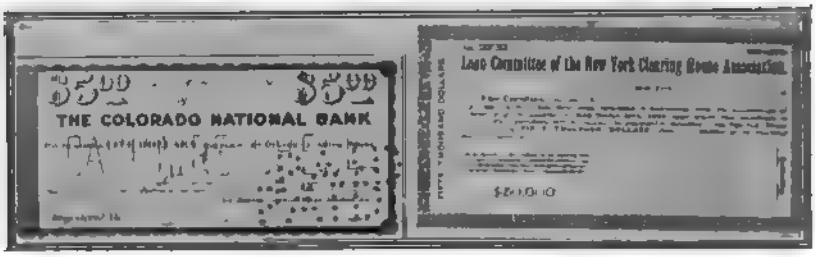
Following many of the active periods of Rail Road building or over-building, traffic was scarce and rates were low. During these periods, many Rail Roads walked the financial plank, as we have recited.

The cycles of storms in the Rail Road skies began as early as 1834, the first lasting until 1840; in 1857 the financial skies darkened again, and the clouds hung low until after the close of the Civil War in 1865.

Destruction From Necessity.

Meantime, few of the Southern Rail Roads paid dividends. Many were ruined; tracks were torn up for hundreds of miles; locomotives were destroyed and bridges and cars were burned. They were subjected to all the trials and strain of military occupation and use, the accompanying neglect of maintenance, and sometimes almost obliteration.

In 1873, and for several years afterwards, two-sevenths of the Rail Roads in the country were operating for less than cost, and a



PANIC SUBSTITUTES FOR MONEY.
CLEARING HOUSE CHECK. LOAN CERTIFICATE OF THE NEW YORK CLEARING HOUSE ASSOCIATION.

more than correspondingly large part of the people were getting the benefit in "bargain-priced transportation."

Disasters in the Eighties.

It was not until 1880 that conditions began to get back to normal, and then the improvement was of short duration, for in 1884, 48 companies were found in the minus column, or list of those furnishing less-than-cost transportation; from 1885 to 1887 93 roads joined them, and 20 others followed in 1893; and so the long list of transportation companies which did work on a basis too low to make both ends meet became ever larger.

Examples of Losses.

The stocks of two roads now selling at high prices, which are believed to be very valuable possessions, have had far from prosperous careers on the whole.

Striking Instances.

The Northern Pacific Rail Road furnishes an illustration of operation at no profit to the owners. The Southern Pacific furnishes another. The latter was operated 20 years without paying a cent in dividends, every dollar taken in being necessary for upbuilding the property and creating a working capital.

For a number of years after its rehabilitation, the Baltimore & Ohio paid no profit whatever, while everything the Wabash and numerous other Rail Roads have taken out of the pockets of their patrons beyond fixed charges, has gone back into the roads.

Looking Over the Hill.

It is well to consider, however, whether the public gets more than nominal or temporary benefit from such conditions. Can a bankrupt livery stable permanently furnish transportation at less cost than a successful one? How many are benefited by the failure of prominent banks, merchants, manufacturers, or any industries of importance?

Fewer still would be benefited by the failure or less-than-cost operation of that industry on which communities most depend for the marketing of their staples and products, and the maintenance and increasing value of farms, real estate and property in general—transportation.

A Business Principle. The poverty stricken or poorly equipped Rail Road will lose money at high transportation rates, while its well-equipped, up-to-date neighbor will make profits at low rates, just as the shiftless and ill-equipped farmer will lose money, while his well-equipped neighbor may make it, and the former, as a rule, is neither an ornament nor desirable. The residents of many communities, on the other hand, delight to tell of the universal prosperity of their region, a prosperity which includes the Rail Road as well as the farm.

AN ECONOMIC FACTOR ON PROSPEROUS LINES. A MODERN MALLET WITH TWELVE DRIVERS.

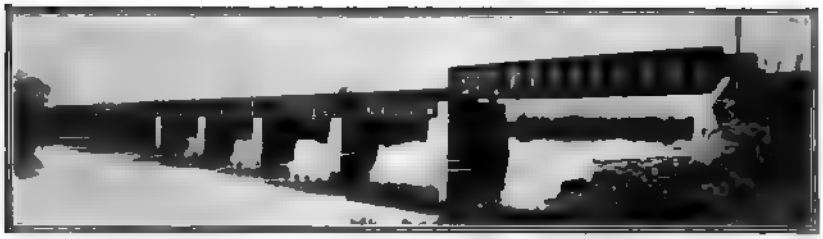
The maintenance of a pauper is a charge on any community, and while in the case of the Rail Road its cost may not be as obvious, the country through which it passes nevertheless suffers.

The Best Asset. The profitably operated Rail Roads, which have equipped themselves in the best possible manner, enabling them to give the best service at the lowest rates, are an important asset to any community, and have brought to the nation an immense saving in the shape of freight-rate reductions. But only a road with first-class equipment, up-to-date roadbed, and well-trained, well-paid and therefore efficient employees, can be operated at a low rate of cost. When, however, it is bankrupt, it cannot put itself into this condition.

The American shipper apparently has received very cheap transportation; and when his Rail Road is making some money and paying a dividend, should he ignore the periods when it struggled along in insolvency, working for less than the mere expense of keeping it?

Where the Profit Lies. People as a whole ultimately get the greatest benefits in rate reductions, by permitting the Rail Roads to be conducted on the basis of other business enterprises which are successful and profitable, which are modernized and improved as new and more economic machinery is discovered.

Any man who lives along the line of an inefficient or bankrupt road would gladly exchange his property, if he could, for equally good land along the line of a more efficient, dividend paying road, even if it should be necessary for him to pay perhaps a little more money for very much more frequent and better transportation service.



A RAIL WAY HIGHWAY, BRIDGE, BALDWINSVILLE, NEW YORK. D., L. & W.

SECTION XVI.

WHO ARE IN THE RAIL ROAD BUSINESS?

Who Own the Steam Roads?

Our Steam Roads, the modern associates of progress and prosperity, are great big business enterprises, with an enormous number of partners.

Repute Not Ownership.

We have for years heard of the "Gould" lines, the "Vanderbilt" lines, the "Hill" lines. Probably many imagine that the Vanderbilts own the "Vanderbilt" lines, and the Goulds the "Gould" lines, lock, stock and barrel.

But the entire Vanderbilt fortunes, for instance, if invested in nothing else, would probably not pay for 20 per cent of all the securities of the so-called Vanderbilt lines.

Little Interest.

When, some years, ago, Cornelius Vanderbilt died, leaving an estate of $70,000,000, only a few thousand dollars was found to be invested in New York Central stock.

It is a known fact that the present Vanderbilts are not the largest holders of that stock. In fact, a recent statement shows that they own only $10,000,000 of the total stock of $409,048,845. There are probably 50,000 partners in the various lines which make up what is known as the "Vanderbilt System."

Harriman's 30,000 Partners.

In the same way, much is said of the "Harriman" roads. Popular impression would lead to the belief that the late E H Harriman owned them all, and that any action against that property was an action directly against him. On the contrary, the ownership of these Western roads was vested in over 30,000 partners.

As a matter of fact, if Mr. Harriman's personal fortune had been as large as the most liberal estimates of it, it would not have been large enough to buy outright more than a moderate percentage of the total securities of the so-called Harriman lines.

Who Are the Owners?

The same is doubtless true of the so-called Hill lines, the Morgan lines, etc. There are tens of thousands of partners in the corporations with which these gentlemen's names are associated, but it is an interesting fact that those roads with which certain men's names have become identified are among the most successful.

Who really does own the Steam Roads?

Up to the date of his enforced retirement, the Illinois Central was popularly supposed to be owned very largely by Mr. Stuyvesant Fish. But its books, a few years ago, showed 9,173 owners, of which army 7,174 were privates, owning less than 100 shares each, their average holding being only 23 shares of $100 par value. There were 391 who owned 100 shares each, and 1,281 who owned from 101 to 1,999 shares. The holders of small amounts, or privates, numbered 8,884, and the holders of over 500 shares only 289.

Their Income.

The average annual income of the 8,884 small holders from a 6 per cent dividend amounted to only $333.41, just 91 cents a day. The largest holders averaged but $3,000 yearly from their investments in the road's shares.

The shares in the Pennsylvania Rail Road are owned by an army of 60,000, of which army 45 per cent are women.

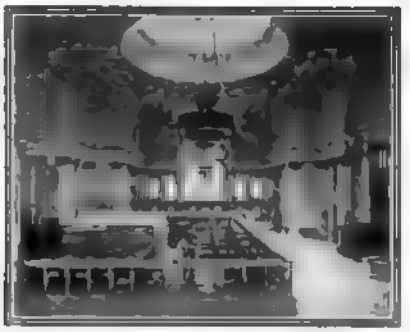
Owners. Direct

There are 365,000 direct holders of stock in our transportation systems, including estates and their beneficiaries. But even more widely distributed are the holdings in their bonds; there are probably over 1,000,000 holders of these among the thrifty of our nation.

Let us see how the other savers in our community, indirect owners, are interested in the success of the Steam Road business.

Owned by Depositors.

The national banks of our country have on their books some 15,000,000 accounts; these banks hold approximately $500,000,000 worth of Rail Road securities among their assets as a guarantee fund for their depositors.



INTERIOR NATIONAL CITY BANK, NEW YORK.

Most savings banks have no capital, or only a nominal one, the majority of those in the East being simply mutual banks or partnerships; therefore the depositors own the banks and all their assets and property. The banks' officers are only trustees and agents acting for the depositors and owners.

Hence the 8,831,000 depositors are practically direct owners of the $618,000,000 worth of Rail Road securities held by the savings banks.

The loan and trust companies and special depositing institutions held in deposits, in 1908, $286,000,000, of which $29,000,000 was invested in Rail Way securities; the state banks held $2,698,000 in Steam Road securities.

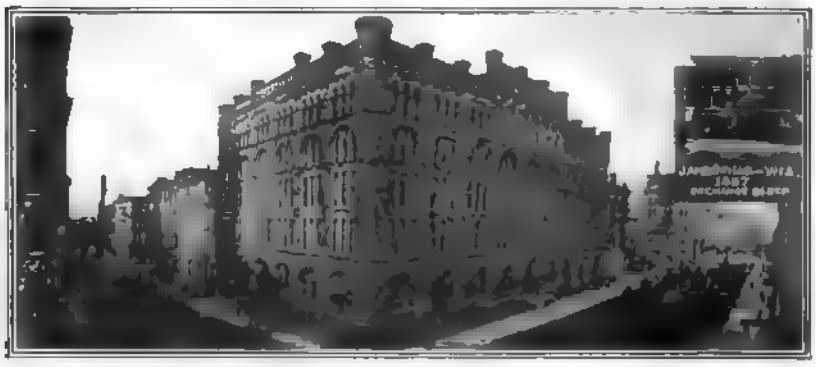
$70 Per Depositor.

The average saving of each depositor is $420; approximately one-sixth of this sum, therefore, is invested in the Rail Road shares. If the stocks and bonds decline in value, the value of the assets of the bank, the depositors' property, for which their money has been exchanged, is just so much less.

Our educational institutions have practically 33 per cent of their endowment funds invested in Rail Roads.

Securities of Insurance Cos.

Not all of us have savings bank accounts, but many own property which is insured against loss or damage by fire. The policy holder will be interested to know how his interests are intertwined with those of modern transportation mediums.



THE NORTH-WESTERN INSURANCE COMPANY BUILDING, 1857 1910.

The fire insurance companies registered in a single state hold to protect their policy holders, $400,000,000 in securities; of this approximately $100,000,000 is in Rail Way securities. This covers risks of $7,543,000,000. The policy holders depend to this important extent upon the security of Rail Road shares for the payment of losses.

Rail Roads and Insurance.

So with life insurance policies. There are approximately 19,000,000 holders of industrial insurance policies, insured for nearly $2,600,000,000. There are 6,000,000 other life insurance policyholders insured for $11,500,000,000.

The reserve funds of the six largest life insuring companies—the resources which secure these policies—include $947,000,000 in Rail Road stocks and bonds out of a total for these companies of $1,208,000,000. Many of the companies are mutuals, which have no stock, and the policyholders are the direct owners of all the assets, including Rail Road holdings.

Assessment and fraternal companies have 8,630,000 members, and they also are interested to the extent of several millions in Rail Ways.

Individual Ownership.

The increase in the number of stockholders of 11 prominent Rail Roads, from 1904 to 1908 was 57 per cent. Securities in small lots are largely held throughout the West, and in all parts of the country there is wide investment of trust funds in Rail Way securities. These are not held for speculation.

N. W Fuel Company's electric dock, Superior, Wis., where fuel for the Northwest is transferred to rails.

Labor Invests.

The investment of savings by working men in the corporations of their employers is becoming more and more widespread. The distribution of profits among employees, a corporation innovation of very recent years, is by some called the soundest kind of profit sharing.

The American Railroad Employes and Investors' Association, the heads of which are P. H. Morrisey, C. D. Kellogg and W. R. Morrison, is an important factor in this connection.

One-third of the 2,500 shareholders of the National Biscuit Company, are employes.

Employes Part Owners.

On the New York Central, Pennsylvania and other leading Rail Roads, many of the conductors and other employes hold interest according to their means, and are partners in the corporation for which they work.

There are 115,000 partners in the Steel Corporation. More than 34,000 of them are employes of the company, and the earnings upon their savings are dependent upon the earnings of the industry.

Dependent on The Rail Roads.

The profits of the steel industry, again, are dependent upon the consumption of its products. The transportation companies are the largest consumers. Therefore, the earnings of the steel companies are closely connected with the prosperity of our carrying companies.

The Lake Superior Copper companies have 30,000 partners, the profit on whose savings is dependent to a very considerable extent upon the consumption of copper by our common carriers.

The Real Possessors.

The Pennsylvania Rail Road gained 18,000 new partners in a single year. Half of its 60,000 shareholders own less than ten shares each, showing that it is not owned by the capitalist, but by your friend and neighbor, the man who has put by his dollars and has invested them.

This Rail Road, whose securities have become standard, gives practical proof that the thrifty of small means as well as large invest in those corporations whose earnings are so regular that the investors in them can feel secure of a steady return on their money.

Only Prosperity Benefits.

Some people believe that the sooner all our Rail Roads get upon a substantial dividend paying basis, the better for the country, for people will then invest in new Rail Roads, and improve the old ones, increasing efficiency and economy of operation, thus lessening transportation cost despite the fact that dividends may be paid, and the country at large will get the benefit of new construction.

Getting Closer Into Details.

An example of the fact that successful Rail Roads attract substantially all classes of people is found in the list of partners or stockholders of one of the oldest Rail Roads in the country, a transportation company which has paid dividends continually since 1836, with the exception of the year that General Sherman tore up its tracks on his march to the sea.

The distribution of this ownership among 1,096 holders recently was: women, 494; men, 345; trustees, 127; estates, 63; guardians, 16; executives, 8; church and religious societies, 14; schools and colleges, 5; asylums and hospitals, 2; societies, 3; business firms, 8; insurance companies, 7; banks, 4.

The average holding is $3,800, and the average income $1.14 a day.

"They Also Serve."

There was a time when our Rail Road securities were largely held by foreigners, but the ups and downs of our Rail Roads, the wide fluctuations in value, the many receiverships, largely exhausted the patience and confidence of foreign holders, and many of those securities have come home to roost.

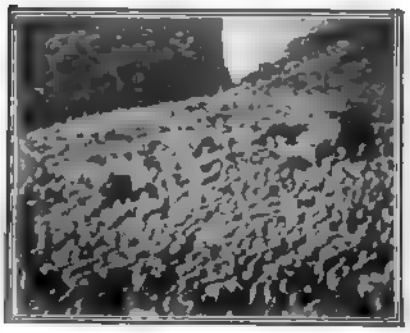
We should sincerely welcome the distribution of the ownership

of corporations among a large number of investing shareholders, as this, to a large extent, prevents the manipulation of securities and control by speculators.

The Next Step. We have now given an idea of the people who are to-day interested in the ownership of our Rail Roads. Those who should next identify themselves with our hauling interests are the shipper and producer, as they are those who make up the classes most intimately concerned with the operation and extension of improved transportation. The fog will eventually lift that has obscured the very real partnership and mutual interest of the man in the transportation business with the men in the business of producing, the shipper, the miner, the farmer, the manufacturer, and so on down the line.

Benefit of All. When that is done, the many engaged in these various enterprises will discover that there is no place where their surplus funds can be put with greater benefit to themselves as business men than in the steam carrying business. They will then see clearly that the extension and improvement of the business which is fetching and carrying, will be as much for the benefit of producer and consumer as for the stockholder, and no less for the greatness and growth, the progress and prosperity of the nation.

The extension of Rail Roads into new productive areas should decrease the cost of living, which is of interest and importance to all.



A BAND OF SHEEP, WYO.

REAPER AND BINDER

Who Are Interested in and Dependent on Our Rail Ways?

The Stockholders. It would seem pertinent and instructive to determine who are interested in the progress and prosperity of our Rail Roads. It appears that through the various channels mentioned, exclusive of the number interested because of deposits in state banks, trust companies and as holders of fire insurance policies—these figures not being available—approximately 58,000,000 people are deeply concerned in the prosperity of our great land transportation system.

61,000,000 in Interest.

Add to these the 1,500,000 employes drawing their entire living from the Rail Ways, and as many more employed collaterally, in producing things for Rail Roads, and we have 61,000,000 people.

It is obvious that there are many duplications in these lists—the depositor in one of the several classes of banks probably has insured his life and those of members of his family. And yet there are but few families in the land one or more of whose members is not represented in this tremendous list.

The Farm's Assistant.

All farmers in the United States—and there are 10,381,000 of them, on 5,739,657 farms averaging 145 acres each—take pride in their horses and depend upon them to transport their products to the market. The farmer's horses carry his produce only the first stage of its journey, an average of nine and a half miles to its first market, the Rail Road station.

After the produce is delivered to a Rail Road, the farmer has to depend upon the iron horse to transport it sixteen times as far as he has carried it, to its final market. If the farmer delivered his produce to another farmer, or to a teamster, to have him transport it the rest of the distance, he would be as much interested in the quality of the latter's horses as in his own. It appears, therefore, that his interest in the steam horse is scarcely less intimate.

SPOKANE, WASH., GROWN OVER NIGHT

PORTLAND, ORE.

The City's Dependency.

To the resident of the city, the Iron Road is quite as important, for if it should stop running how long before a great center of population like New York would be in want? It has been said: "On the second day New York would be inconvenienced; on the third it would suffer; on the fourth it would probably begin to starve."

A gentleman whose position and knowledge are authoritative, told the writer that during the congestion of Rail Road traffic, several years ago, the supply of fuel on hand in New York for lighting purposes was so small that there were times when the city was within one hour of darkness; that great foreign ships would have been obliged to wait days before they could have proceeded if any

grave accident to the Rail Roads had occurred. The supply of fuel for domestic purposes was also at a minimum.

The Worker. The factory worker is vitally concerned, for to a great extent, his livelihood depends upon the iron steed and its work. It brings his raw material and the fuel producing the power which aids in turning it into a manufactured article, and takes away and distributes the product.

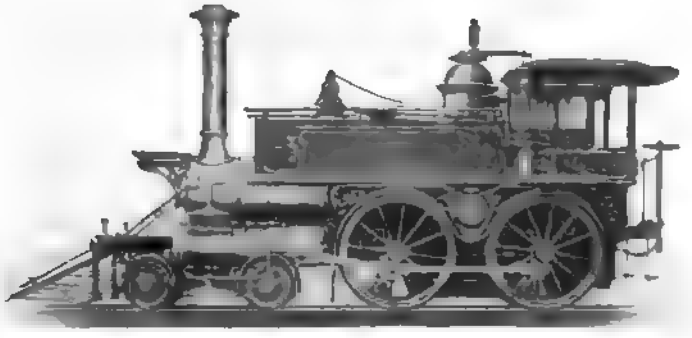
Did you ever stop to think how long the millstones would turn if the flour were not taken away, while the wheat kept pouring in? how long would even an industry be conducted if its output were not taken away and distributed?

Rail Road Indispensable. Ultimate analysis shows that carpenter, mason, iron worker, skilled or unskilled laboring man, union or non-union, clerk in store or office, lawyer, preacher, merchant, doctor, poor man or millionaire—all are dependent for food supply, fuel, clothing, mail and communication, lighting and pleasure, upon modern transportation.

Who Are Not Interested in the Rail Road Business?

It seems very hard to find the person in any occupation—man, woman or child—who is not interested, directly or indirectly, in our public carriage business, or in some way dependent upon it.

This is the best way to realize the vital necessity and importance of this great industry of carriage and transportation, and its bearing upon your individual progress and prosperity.



A Centennial Gold Medal engine of 1876

LOCOMOTIVE WITH 82 MEN ON ONE SIDE.

SECTION XVII.

SPENDING FOR LABOR.

The Army of Employes.

The truly vast sums disbursed by the Steam Roads of the United States find their largest outlet in the payment of wages. In this connection our transportation systems make their greatest and broadest contribution to our progress and prosperity.

The Direct Influence.

No other form of disbursement finds its way so immediately into the tributaries, the feeders and the greater streams of the nation's business and commerce. No other so quickly affects the content and comfort of families. No other sooner passes on into the hands of the butcher, the baker, the grocer, and from them in turn in wages to their employes, and to the wholesale merchant, manufacturer, and farmer.

What other, if stopped, would be so instantly missed, not

merely in the country and the thousand small communities where laborers dwell, but in the centers of trade and industry?

The Brake and Wheel Army.

More than one and a half times as many Rail Way employes go to work every day as there were soldiers in the Federal army at any one time in the civil war.

Our army of brake and wheel of 1,524,000 men, compared with the armies of the world, makes many of the latter sink almost into insignificance. The German army has 620,000 men actively available for service; France. 550,000; England, 255,000; Japan, 225,000. Yet the number of Steam Road employes, when it reached 1,672,000 in 1907, was 22,000 more than all of them combined.

The Rail Road army is trained, disciplined, effective. Unlike armies of sword and rifle, it is as useful in times of peace as in times of war. It is not destructive; it is constructive.

The New York Central Lines employ an average of 12 men to each route mile—some 145,000 men—or one man to every 150 yards of line.

THE HORSESHOE CURVE, PENNSYLVANIA RAILWAY, ON A HEAVY GRADE

A Man Every Fifteen Rods.

The Pennsylvania has, east of Pittsburg, a man for every fifteen rods of its 6,100 miles of line. It pays these 136,000 workers approximately a million dollars every three business days in wages; and its yearly wage expenditure of $100,000,000 for this one section of its vast system is $16,400 per mile. This $100,000,000 would pay the wages of an army of nearly half a million soldiers at the military rate.

Practically a regiment of 700 men is in active service for every hundred miles of Rail Road, throughout the United States.

A Classification.

A mere enumeration of the branches of service into which the Rail Road army is divided will tell better than comparisons how varied are the duties that must be performed, how many branches of labor find employment and how numerous are the squads, companies, battalions and regiments, and the services in which the different officers and men are engaged.

The following list shows the classification of employes of the New York Central Lines:

In All Departments.

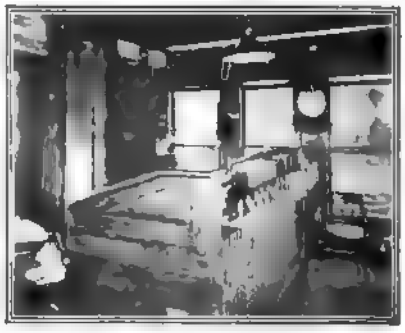
Clerk,	Special Police,	Helper,
Stenographer,	Inspector,	Laborer,
Messenger,	Time-keeper,	Cleaner,
Watchman,	Store-keeper,	Carpenter,
	Plumber.	

Transportation Department.

Train Dispatcher,	Ticket Receiver,	Switch-Tender,
Telegraph Operator,	Station Cashier,	Accountant,
Signalman,	Parcel Agent,	Chalker,
Leverman,	Information Agent,	Number-taker,
Signal Mechanic,	Train Announcer,	Carder,
Signal Electrician,	Station Baggageman,	Caller,
Signal Batteryman,	Doorman,	Tallyman,
Signal Lineman	Porter,	Sealer,
Signal Wireman,	Usher,	Car Recorder,
Signal Repairman,	Gate-Tender,	Yard Checker,
Lampman,	Flagman,	Collector,
Station Master,	Yard Master,	Weighmaster,
Station Agent,	Train Director,	Cooper,
Ticket Agent.	Switchman.	Trucker,

TICKET OFFICE, GR. NO. RAILWAY, SEATTLE, WASH

ELECTRIC SWITCH CONTROL STA., N. Y. C.



Passenger Engineman,	Passenger Fireman,	Passenger Conductor,
Freight Engineman,	Freight Fireman,	Trainman,
Switch Engineman,	Switch Fireman,	Train Baggageman,
Work Engineman,	Work Fireman,	Brakeman,
	Freight Conductor,	
	Dummy Boy	

Maintenance of Way Department.

Supervisor,	Trackman,	Laborer,
Section Foreman,	Gardener,	Track Walker.

Engineering Department.

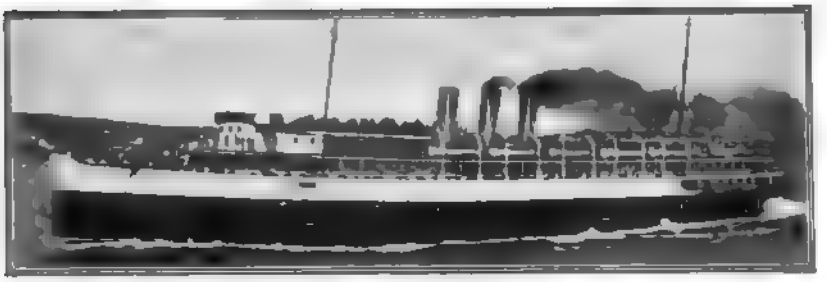
Engineer,
Transitman,
Rodman,
Chainman,
Draftsman.

Bridge and Building Department.

Pile Driver,
Steam Shovel Operator,
Driller,
Powderman,
Torchman,
Bridgeman,
Rigger,
Duct Layer,
Mason,
Water Boy.
Bricklayer,
Concrete Worker,
Finisher,
Boarding Car Attendant,

Equipment Department.

Shop Foreman,
Machinist,
Boilermaker,
Blacksmith,
Steam Fitter,
Pipe Fitter,
Coppersmith,
Tinsmith,
Valve Setter,
Toolman,
Driller,
Bolt Cutter,
Nut Tapper,
Wheel Borer,
Upholsterer,
Car Repairer,
Airbrake Worker,
Coaler,
Chemist,
Wrecking Master,
Crane Engineer,
Rigger,
Car Cleaner,
Coupler,
Gas Maker,
Gas Filler,
Engine Dispatcher,
Engine Caller,
Turntableman,
Traveling Fireman,
Boiler Washer,
Pumper,
Fire-upman,
Oiler,
Hostler,
Wiper,
Fire Cleaner,
Doper,
Dumper,
Flueman,
Headlight Filler,
Sand Dryer,
Grease-cupman,
Traveling Engineman.



PRINCESS CHARLOTTE CAN. PAC. RAILWAY STEAMSHIP

Marine Department.

Master,
Captain,
Wheelman,
Engineer,
Fireman,
Mate,
First Deckhand
Second Deckhand,
Steward,
Boat Shifter,
Floatman,
Freight Handler,
Trimmer,
Shoveler.

Who Gets It. It is the employe out on the road, not the chief in the central city office, who gets most of the wages. The general officers get only $1.54 out of every $100 of wages disbursed.

An Increase. The general increase of wages made necessary by the higher cost of living is illustrated by the Pennsylvania Rail Road. In 1902, it increased the salary of all employes receiving less than $200 per month, 10 per cent. A further addition of 10 per cent was made in 1906.

Taking into account the fact that between 1901 and 1907 the number of employes greatly increased, statistics show that labor cost the Pennsylvania 70 per cent more in 1907 than in 1901. Out of every $400 of the increase, $395, or 98.75 per cent, went to the men drawing less than $200 per month. It went to the "workers"—not to the officers and managers.

What the Raises Mean. The years 1909-10 marked further large wage increases on nearly all important Rail Roads, aggregating approximately $100,000,000 annually. For instance, the New York Central granted increases aggregating $8,000,000; the Baltimore & Ohio's payroll was increased $2,000,000, and the Pennsylvania's $10,000,000.

Pattern Shop, Schenectady Works, American Loco. Co.

The Rail Road Army of the United States.

It is interesting to compare, according to the latest figures, the vast army of Rail Road employes in the United States with certain fighting armies and other vast aggregations of men.

Revolutionary Army. During the seven years of the Revolution, the United States troops engaged numbered in all some 300,000 men. The Rail Way shop men alone number 285,000.

In the struggle of 1812, the United States enlisted altogether 576,000 men. Each day sees a grand total of approximately 422,000 trackmen, switch tenders and telegraph operators go to work on the various Rail Way systems of the United States.

In the war with Mexico, 112,000 men were enlisted in the service of this nation. Their number is exceeded by the 171,000 station men and helpers in the employ of the Rail Roads.

NEW UNION STATION, BALTIMORE, MD.

Spanish War. The 60,000 soldiers who fought against Spain in 1898 were outnumbered by the Rail Ways' general office clerks, of whom there are no less than 65,000.

General Grant had 27,000 men at Fort Donelson. They are outnumbered by the 41,000 section foremen of the Rail Roads to-day.

The total number of men engaged on both sides in the first battle of Bull Run is less than that of Rail Way firemen.

Engineers. The Union troops at the battle of Shiloh are about equalled by the Rail Road engineers.

The number of carpenters working directly for the various Rail Roads almost equals the number of men who fought on the Union side at the battle of Gettysburg; those who fought on both sides at Bull Run, Antietam, Gettysburg and Corinth combined, number only as many as the trackmen of our Rail Roads.

Sherman's March. The trainmen outnumber nearly five to one the army with which Sherman made his march to the sea and fought the battle of Savannah.

The 120,000 engineers and firemen are within 10,000 as numerous as the people living in the great tract of land known as Wyoming.

Naval Insignificance. General trainmen in addition to those enumerated above, number 159,000 men. This exceeds the combined naval strength of the United States, France, Germany and Italy.

Switzerland's total war strength, proportionately the greatest in the world, is 254,000 men, while the number of miscellaneous workmen of our Rail Roads is 210,000 men.

Our famous "Eastern fleet" which circled the globe in 1907-1908, carried 15,000 men; there are three times as many switchmen, etc., employed on United States Rail Roads.

Balance of Power. As late as 1836, the year of Martin Van Buren's election as President, there were but 1,500,000 votes cast in the United States, less than the number of Rail Road employes to-day.

Up to a few years ago, the result of every presidential election could have been changed had such a number of men as the above

made themselves a political factor, deciding to vote either one way or the other.

More Than Countries.

Their number is greater than the population of New South Wales by over 100,000; greater than that of Victoria by 300,000; it is double that of New Zealand.

Only half of the states and territories in the Union have a population of more than 1,500,000. The total number of males in the great state of Texas is 1,578,000, only little more than the Rail Way employes. The total population of Arkansas, 1,500,000, is less than the workmen upon our Rail Roads.

Army of Students.

The total number of pupils in all the schools of this country, including both private and public institutions, exclusive of primary and grammar grades, is 12,144,000, only one-third more than the army of Rail Road employes

An army of employes, Pullman car shops Pullman, Ills.

In the average procession about 7,000 men pass a given point in an hour. If the Rail Road army were marching along a wide street at this rate, it would take eighteen and a half days of ten hours each for one to see them pass a given point If the families of the marchers were added, there would be approximately 7,000,000 marchers, to review whom it would take almost three months.

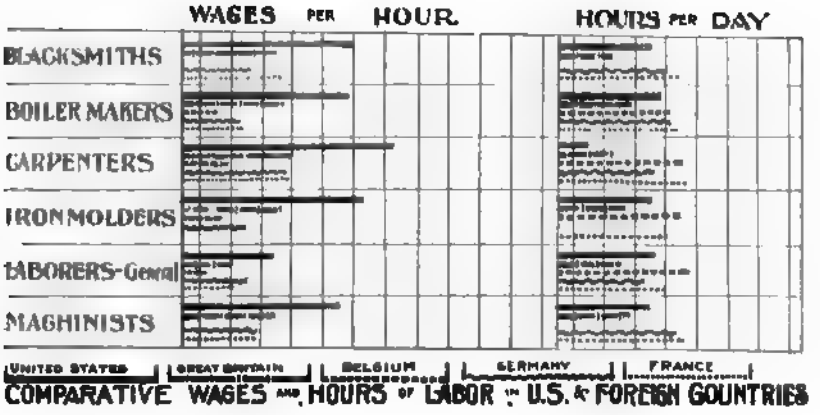
A 500-Mile Line.

Standing in review, shoulder to shoulder, they would form a line 450 miles long, almost half the distance from New York to Chicago, and if they were standing touching hands, would extend almost 1,500 miles, or half way across the continent.

Practically dependent upon the Rail Roads, as we point out in our sections on the express and postal services, are the 72,000 workers engaged in the express service, and the 22,000 Rail Way postal employes. No less dependent upon them are the 1,500,000 employes of various industries supplying the Rail Roads.

Why Stop?

But all industries are to a large extent dependent, directly or indirectly, upon this industry, synonymous in a great degree, with commerce.



Rail Way Wages, and Some Comparisons.

The wages of Rail Road employes in the United States in 1909 aggregated $1,003,000,000. A sum like this could probably not be counted dollar by dollar, by an individual, in a lifetime.

Mount Everest Topped.

Stacked in half dollar pieces this sum would make more than 400 piles, each as high as the highest mountain peak in the world—Mount Everest, 29,002 feet above the level of the sea.

The wages of a single year, paid out in one dollar bills, would make a waistband as wide as a stair carpet for the globe, for they could be wound around the earth fully five times in a single belt.

Greater Than States.

The total assessed valuation of only twelve states exceeds $1,000,000,000. The total interest bearing debt of the United States in 1909 was $913,000,000, little more than the salary of Rail Road employes for ten months.

The combined yearly expenditure for the British, United States, German, French, Italian and Japanese armies and navies, including wages, food, equipment, etc., is only $1,049,000,000, or little more than our Rail Way wage disbursement.

Cost of War.

The cost of the Russo-Japanese war was a little less than $1,000,000,000. It could be repaid by the Rail Road employes in a single year.

The world's production of gold and silver in 1908 was three hundred million dollars less than the salary of our Rail Road men.

The damage by the great Chicago fire, $165,000,000, rightly considered a national calamity, was less than two months' salary of the Rail Road employes.

In Other Fields.

The wages received in other industries in our country offer interesting comparisons with Rail Way wages. The average salary of a Rail Road employe is $657 per year. With the increase granted lately it averages above $700.

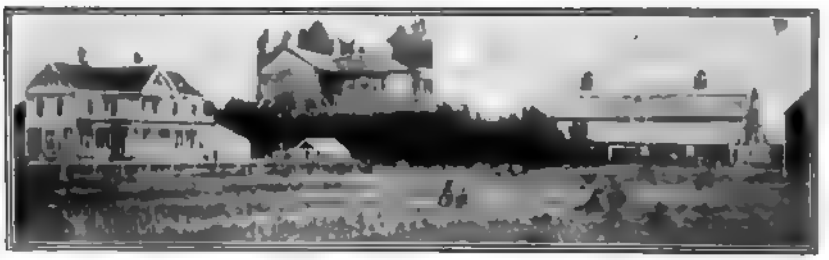
The latest United States Census of Manufactures shows over 5,000,000 people employed in these 15 industries: textiles, iron, steel, lumber, leather, food products, paper and printing, liquors and beverages, chemicals and allied products, clay, glass and stone products, metals and metal products, vehicles for land transportation, shipbuilding, miscellaneous industries, and hand trades. These employes combined, received only two and a half times as much as the 1,524,000 Rail Way employes of the United States.

The Farm and the Rail Road.

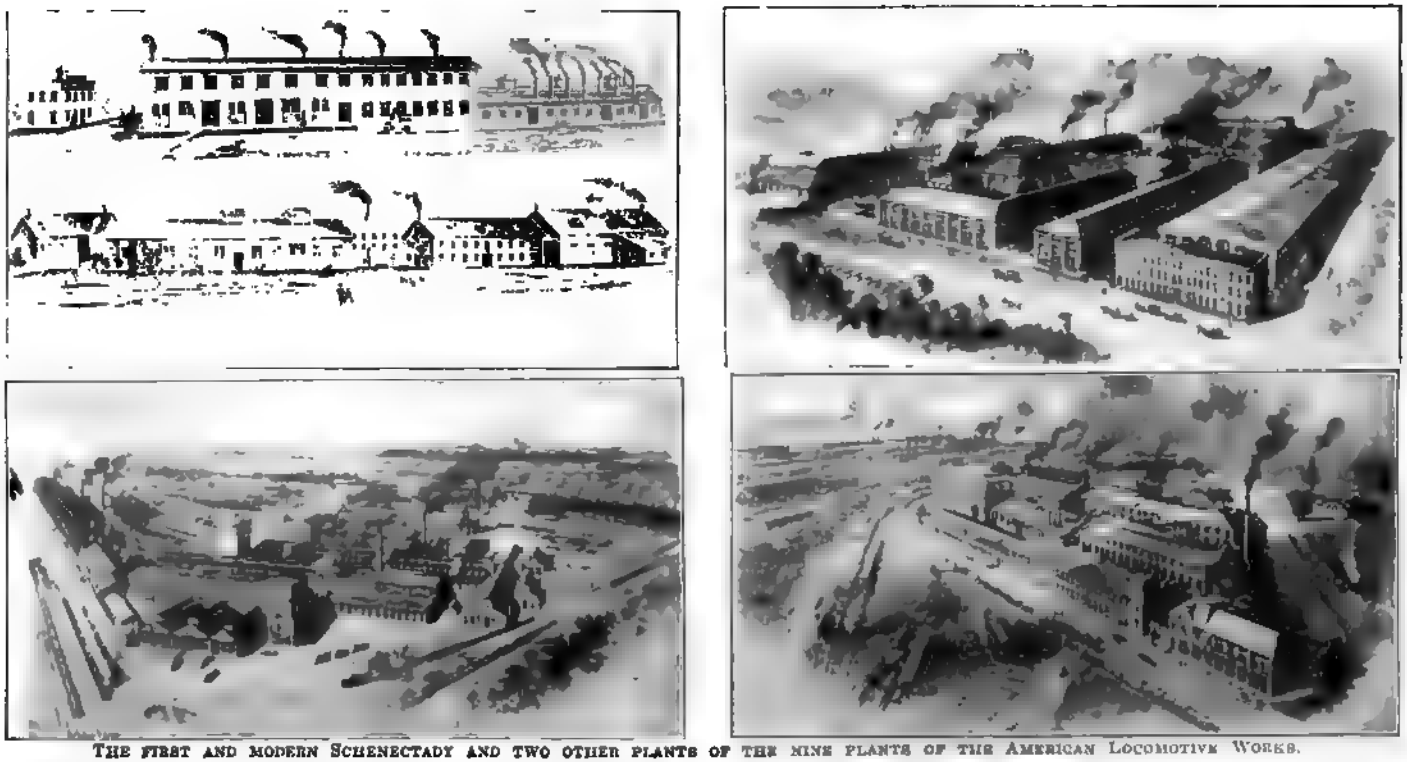
The total wages paid out on 5,700,000 farms is only one-third the annual payroll of the Rail Roads, which, including the salaries for switching companies, was $1,003,270,000 in 1909.

The money of our country passes 50 times through the clearing houses. The money which the Rail Roads disburse also appears many times in the trade transactions of the country, extending our credit to an immense extent, this adding largely to the country's prosperity.

The distribution of Rail Road wages in the United States means that the Rail Roads are practically paying out nearly $360,000 for every business hour in the year. And this in turn is paid out again and again as it passes from one person to another.



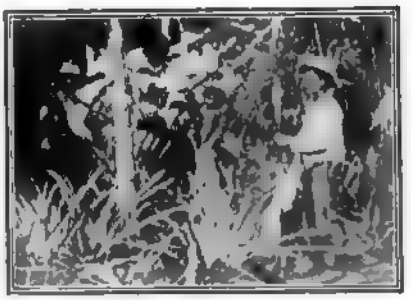
A FARMER'S FIRST AND PRESENT HOME.



THE FIRST AND MODERN SCHENECTADY AND TWO OTHER PLANTS OF THE NINE PLANTS OF THE AMERICAN LOCOMOTIVE WORKS.

RAILWAY SURVEYOR'S CAMP.

SURVEYING IN THE PHILIPPINES



SECTION XVIII.

HUMAN MACHINERY.

The Organization of Our Great Carriers.

The Seven Hundred Human Wheels.

Willingness vs. Capacity.

We all know the budding mechanical genius of the family. When the old grandfather's clock, or perhaps the more modern timepiece of less dignity and value, gets out of order, the ambitious youngster-artisan offers to repair it.

Many of us remember how successfully we took the watch or clock apart in our boyhood days, but few of us can recall an occasion when we succeeded in putting the instrument together again.

In Another Light.

Yet, difficult as this operation seems, the number of wheels in the modern clock is only 10; even the clock which announces the time by striking on a bell has only 14 wheels. The Columbus clock had only four wheels. The modern watch has but six or seven wheels, although the number of parts is about 140.

The complications of the watch or clock seem very slight as compared with the intricacies of the many machines in a great machine shop: judging from the difficulties we laymen experience with the clock, it may be imagined what would be our difficulties with such a plant. As the mechanism of a watch or clock is simple, com-

pared with the latter, so again is the intricate machinery of the latter simple as compared with the human organization of a Rail Road.

Tracing the Veins.

The first department is that of the principal officers, with their more or less numerous staffs. A similarly involved system is found in the engineering department; the bridge department has its great organization; the freight and passenger departments each have their organization; the road department, the legal department, the auditing and financial departments, the operating department, the signal department, the car department, have their separate elaborate human mechanisms. If one endeavors to take apart any of these pieces, or tries to operate it except in absolute unity with all of the other departments, the result is felt disastrously throughout the entire Rail Road machinery.

No Less Difficult.

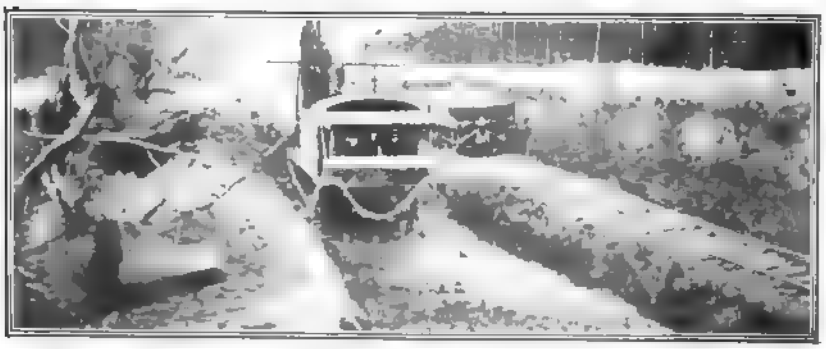
The most delicately adjusted watch will not keep absolutely accurate time for a year. Can we expect the much more intricate movement of the Rail Road to be less delicate?

We know that even the finest particle of dust, which filters into the most carefully fitted watch case, may destroy the accuracy of the timepiece. If such a trifle will destroy the accuracy of so comparatively simple a piece of machinery, it is obvious that the regulation of a Rail Way is a very important and delicate matter.

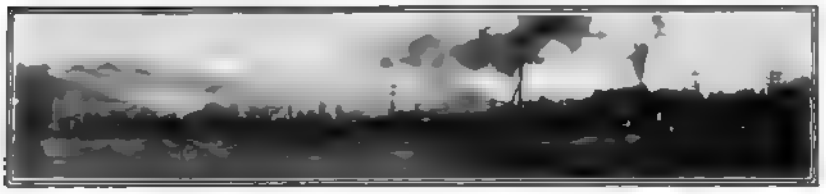
The Layman's Attitude.

The average individual will say: Why should the machinery be so elaborate? Suppose you have 145,000 men in your employ, as has one of our large Rail Roads. Would they constitute anything but a mob without officers, organization, rules and discipline?

Although there are but three great services in the army—the cavalry, the infantry and the artillery—there is one officer for each 17 men. On a Rail Road the branches are much more numerous, but there is only one officer for each 137 men. There are seven hundred different divisions and sub-divisions of labor or human wheels in a great Rail Road system



GRADING THROUGH A SOUTHERN WILDERNESS.



FREIGHT TRAIN AT EVENING OPERATION CONTINUES BUT NIGHT REQUIRES INCREASED VIGILANCE

Completeness. It is an axiom that where great numbers of men are employed, organization is of vital if not supreme importance. How great a part organization plays in the success or defeat of an army is told in the story of the quelling of almost any mob—unorganized as it usually is—by a handful of organized soldiers or constables.

We saw in our Civil War and we saw in the small Spanish-American war, the havoc wrought by having in authority, in place of officers from the regular army, less highly trained men from civil life, or even from the militia.

Rail Road vs. Army Officers. The official staff of a Rail Road may be likened to that of the army and is almost its counterpart. The board of directors is the general staff. The president is the commander-in-chief; his vice-presidents are the major-generals, the freight and passenger traffic and general managers are the division commanders, and their assistants brigade commanders; the division superintendent may be likened to the colonel in an army, and his first assistant to the lieutenant-colonel; the general agents are the majors; the heads of the other departments and their assistants are the captains and lieutenants; the foremen over still smaller bodies are the sergeants and corporals.

The commands of all these minor officers on the important roads, however, are as a rule much greater, numerically, than the commands of the military officers to which we have likened them; the corporal's guard of five, for instance, compares almost insignificantly with the men under the foreman or yardmaster, who may number from fifty to five hundred.

A Voluminous Synopsis. It might be mentioned here that the plan of organization of one of the principal Rail Road systems of the country contains 20,000 words, yet it embodies only a brief statement of the duties of the different employes, setting forth the authority of each man and from whom it is his duty to take and to whom to give his orders This plan, extensive and comprehensive as it is, makes no mention of the army of clerks, bookkeepers, stenographers, etc., in the employ of the Rail Roads, their duties being prescribed by the heads of their departments.

We know how much depends on the organization of a factory, where all the employes are constantly under the eye of the foremen or superintendent. How much more difficult is the mainte-

nance of order and efficiency of a body scattered over perhaps thousands of miles of territory, where thousands of the men whose duties lie along the road, cannot constantly be under the eyes of a superior.

Ensuing Complications.

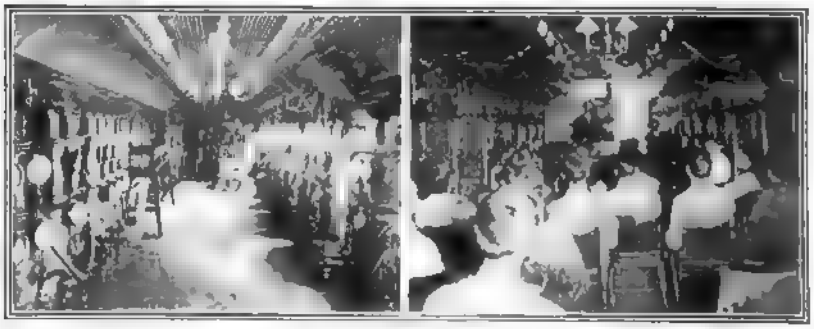
The average factory manufactures clothing, furniture, hardware or some other specialty. The Rail Road might be likened to a great number of factories, scattered over thousands of miles and connected only by a long, uncovered roadway

An individual usually suffers alone from his own mistakes, misunderstandings, errors of judgment, lack of energy or indecision. In connection with the Rail Road such things may mean life and death to hundreds, and in such a great aggregation of people the error of each individual reflects on the entire body.

In Union is Strength.

The object of organization is not to eliminate the human element, but to obtain one smooth unit, and a great piece of perfectly working human machinery. The directors of an organization must see that the plan of operation provides sufficient occupation for each man.

He who has not duties enough becomes indolent, his usefulness is lessened and his prosperity is hurt. On the other hand, his work must not strain him too much, for then his capabilities would in turn be injured. Ready promotion as a reward of good work should



AIRBRAKE SCHOOL CAR SOUTHERN PACIFIC EXAMINATION CAR

be and usually, in our Rail Road corporations, is possible in every position, thus giving added incentive to energy and keeping the employe from narrowing or degenerating into a "hack."

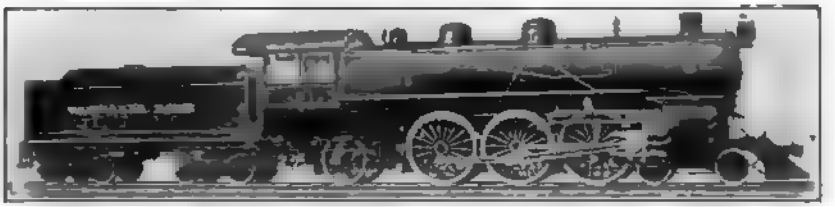
Allowing the Use of Intellect.

Complete centralization such as existed in the British army is undesirable It was reported by a committee, appointed by Great Britain's Secretary of State for War, that one of the causes leading to the failure of the war department in the Boer war, was that, according to the testimony of Field Marshal Lord Roberts, even a field marshal could not transfer a single private from one battery to another, without referring the proposed shift to headquarters.

In India a horse could not be clipped without authority from the quartermaster-general.

The Reductio. How would a similar policy affect our Rail Road industry? Imagine an engineer who, on rounding a curve, sees another train bearing head-on towards his charge—imagine this engineer waiting for sanction from the president of the road, or some public service commission, before putting on the brakes and reversing his engine!

Room must be left for judgment and discrimination for those occasions where their use tends to create the most desirable results.



PRAIRIE TYPE, PASSENGER LOCOMOTIVE. ONLY ONE FIREMAN IN TWENTY BECOMES THE ENGINEER OF A PASSENGER LOCOMOTIVE.

Discipline.

Maintaining Order. We have shown the human machinery of the Rail Road to be more elaborate than that of the army. In the matter of discipline, also, it is not inferior. Order and discipline prevail in the Rail Road army to fully as great an extent as they do in the best of our most modern armies. Authority and responsibility are placed, orders are issued, records are kept, and duties must be performed with just as much regularity and precision.

Every minor department or division has its duties. The Rail Road has its reserve officers and its advance guard, men must go on and off duty with the same precision as sentries are placed and relieved in the army, and in time of peace the private soldier has far less responsibility and his duties are infinitely less important than those of the private in the Rail Road service, the crossing flagman.

Precision and Exactitude. The beautiful precision of movement by a regiment of soldiers is equalled and exceeded a hundred times each day in the movement and passage of trains, and in the handling of both passengers and freight, when these great units must pass and repass at stated points, without delay or collision.

While the Rail Road has no guard-house, lack of attention to duty is met with a "lay-off" or discharge, or some other forceful reminder that keeps discipline on keen edge and makes the organization, management and conduct of the great Rail Road army a model for almost any military organization in the world.

Metal cogs and parts are made mechanically, so that they fit easily, one into the other. But how difficult is it to adjust hundreds of human beings to each other, when each one is differently constituted.

The latest United States Census of Manufactures shows over 5,000,000 people employed in these 15 industries: textiles, iron, steel, lumber, leather, food products, paper and printing, liquors and beverages, chemicals and allied products, clay, glass and stone products, metals and metal products, vehicles for land transportation, shipbuilding, miscellaneous industries, and hand trades. These employes combined, received only two and a half times as much as the 1,524,000 Rail Way employes of the United States.

The Farm and the Rail Road.

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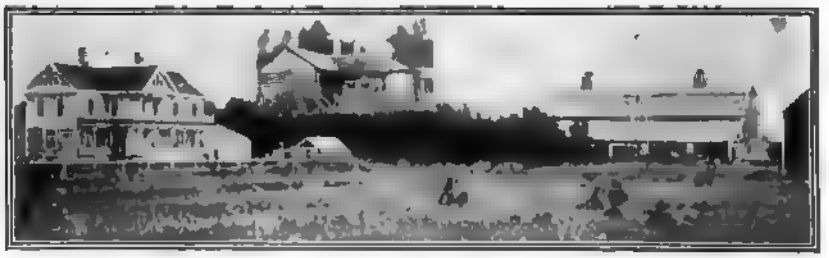


A FARMER'S FIRST AND PRESENT HOME.

The Pension Funds.

A number of lines pension aged and disabled employes, the beneficiaries in the case of the former being those who have served the company a certain number of years and have reached the age of 70. The amount of the pension is based upon the length of service. Usually it is one per cent of the average past 10 years' salary, multiplied by the number of years of service.

Situations that are practically sinecures frequently are given to those old men who have not reached the pension age.

Some of the companies, to encourage thrift, have also established the equivalent of savings banks, and allow three and a half and four per cent on deposits made by the employes.

Those Left Behind.

The Pennsylvania Rail Road's relief funds, of which 85 per cent of the employes are members, have paid out, since their installation in the late eighties, a total of $29,000,000 in benefits to the families of members who died and to those members who were incapacitated.

STUDY ROOM OF APPRENTICES SOUTHERN PACIFIC RAILWAY SHOPS

The pension and relief department of the Baltimore & Ohio is one of the oldest and most noted, and is not far behind the Pennsylvania in the millions it has disbursed

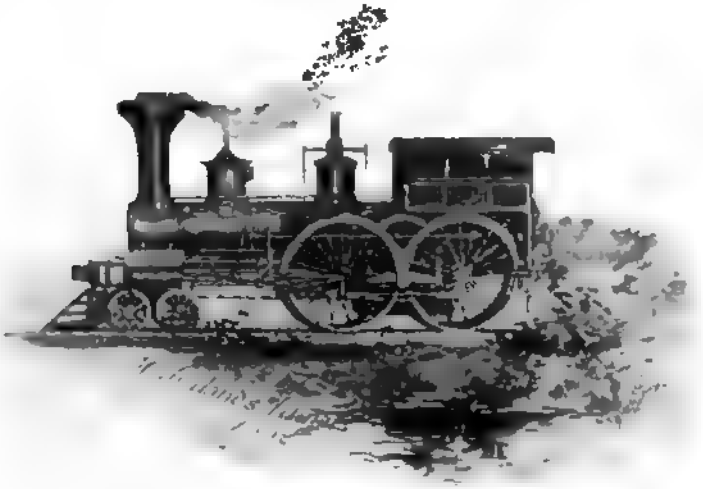
Knowledge the Best Benefit.

A phase of this "enlightened selfishness" rapidly gaining importance and popularity because of the direct and noticeable benefits derived, is that of teaching employes to prepare themselves for high positions. On many roads the system of teaching apprentices and those occupying regular positions has already assumed important proportions.

Schools with efficient teachers and lecturers are maintained by the roads, tuition usually being free to employes; branches such as mechanical and electrical engineering are taught. In connection with these courses, circulating libraries of technical and other books are supplied, so that the employes may continue and broaden their studies, or find recreation in works of a lighter character.

Helping to Climb Up.

Nearly every Rail Road machine shop of importance has its training department for mechanics, many of the highest officials on the Pennsylvania and other Steam Roads being graduates of these shops.



MELHOLLAND'S "ILLINOIS," 1852.

A WHALEBACK
ONE OF THE LINKS BETWEEN THE RAILS FROM THE ORE MINES AND THOSE TO THE FURNACE.

SECTION XIX.

HOW THE RAIL ROAD BUSINESS IS BUILT UP AND MAINTAINED.

Traffic and Operation.

From the traffic of a Rail Road is derived its sustenance; operation is its circulation. Without the first, there would be no need for the second; without the second, the first would soon cease to be forthcoming. The utmost harmony must obtain between the two departments

The operating department must consult the judgment and needs of the traffic department in arranging train service, in the loading and unloading of cars, and in the location and management of stations and terminals, while the traffic department must have the assistance and advice of the operating department in obtaining such traffic as the road is able to handle

The Mainspring of Business.

The conduct and management of the traffic department, the mainspring of the Rail Road's business, calls for the highest order of talent and intellect. In no branch of the service is practical knowledge of the workings of the property as a great machine more requisite.

The chief traffic officer, who must be familiar with all the de-

tails of traffic, must have an extended acquaintance with shippers and employes alike, for the success of his department depends on the harmonious relationship of the shippers, the handlers and the Rail Road.

Damning and Pleasing.

Gruff or inconsiderate men no longer come into contact with the public. The "public-be-damned" idea has given way to that of "the public be pleased." A certain Rail Road has even opened a "school of politeness" for those of its employes who come into contact with the public. There may be exceptions, but there is a great improvement in this direction.

Broadly, the traffic department is engaged in the sale of transportation. Effective and economical sale of any commodity or service requires an organization working as a unit. In the Rail Road business such an organization must have, to support its efforts, satisfactory service, rates permitting a profit to the shipper, and an assurance of the safety of the goods entrusted to the carrier.

Creating Business.

To solicit freight and passenger transportation, each Rail Road employs a small army of men who are salesmen pure and simple. Unlike the commercial "drummer," they carry no samples, but the salesmanship exercised is of an equally high grade.

Passenger traffic can be and to a great extent is "created." Advertising is a recognized factor as a direct producer and as a valuable adjunct to personal solicitation. Advertising in newspapers, both directly and by news items, is to-day considered the form from which the best results are obtained.

The leading Rail Roads expend from fifty thousand to a million and a quarter dollars in cash for their yearly advertising campaigns. The total spent by all roads in one year was $7,500,000.

Over the Field.

The solicitors for traffic are not stay-at-homes. All of them are not confined to the same town or to one section of the city. There is a general passenger agent who has assistant general passenger agents, city passenger agents and district passenger agents, the ter-

SEATTLE AS A VILLAGE IN 1878.

ritory under the control of each of whom is indicated by his title. The freight department has a similar organization and force.

Where there is competition for traffic, these organizations are particularly busy, but on the successful discharge by the operating department of the obligation the traffic department assumes, depends the building up and continuance of patronage.

Rail Roads' Watchfulness. The writer recently addressed letters to four Rail Roads asking for rates on a small shipment of household goods from New York to Chicago. Within 24 hours representatives of three Rail Roads called. They were as eager to secure this little shipment as if it had been a trainload. Each extolled the merits of his own road and expatiated on its advantages. One representative even had a van man call and figure on cartage, so that the shipment might be taken from the house with the least possible inconvenience and delay.

Trade rivalries of cities and towns, diversity of interests between various places, create problems requiring delicate handling by the traffic men and calling for intimate knowledge of topographical, physical, industrial and agricultural conditions.

Pioneer Work. Industries must be secured and fostered, new fields opened, and even new towns founded; freight and passenger service must be provided to meet existing and prospective traffic, and the good will of the public won and retained as far as possible by anticipating its needs.

One of the most important duties of the department is making and supervising freight and passenger rates. The adjustments and readjustments of commerce are minute and constant; new conditions arise and old conditions change, requiring immediate consideration and prompt action.

The Importance of Rates. Upon the skill exercised in fixing rates, so as to protect the Rail Road and at the same time stimulate production, depends much of the carrier's earnings, and the progress and prosperity of the territory served.

Second Avenue, Seattle, 1910

Riverside Avenue, Spokane.

UNION STATION, INDIANAPOLIS, IND.

Passenger Traffic. How We Are Carried.

Freight More Important.

On all important Rail Roads of the United States, except a single line, which has paid no dividends for years, and with possibly one other exception, passenger traffic is subsidiary in volume and in the revenue derived therefrom to freight traffic. There are many difficulties connected with the former which require special attention, making it costly and complex; a large number of employes is required to attend to stations; high-class cars and locomotives traveling at high speed must be provided, and all freight traffic is made subservient to it.

Someone has said that the Rail Roads consider the passenger department in somewhat the same light that we look on the appendix, of no apparent use, though a great deal of trouble.

Two Classes.

The two classes of traveling public may generally be divided into those who travel in the regular passenger or "day" coaches, and those who have "reserved seats," traveling in parlor and sleeping cars.

The rate of fare charged by the Rail Road company is the same for both classes, but an extra fare is collected by the special car owners, the Pullman Company, from those who ride in their cars. The difference, however, only amounts to about one-half a cent a mile. In European countries the first-class fare is from 50 to 100 per cent above the second-class fare. Yet the conveniences offered by the American parlor car are vastly superior to those of the European first-class carriage.

The Great Object.

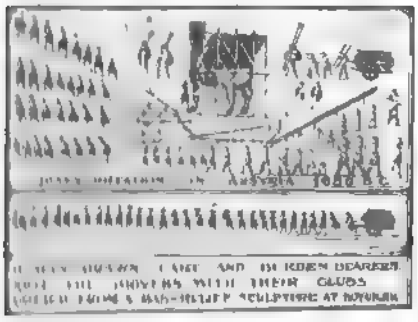
The main duty of the passenger traffic department is to secure the maximum number of passengers to make use of the road, on which number the passenger train schedule depends. In those regions where there is only a small population, it is often impossible to have anything like a train schedule with more than one or two trains daily. Nevertheless, a larger number of trains is frequently provided, even though at a direct loss to the Steam Road.

For the Good of the Service. The reason for this policy sometimes is that when a man uses a certain line for the shipment of his freight, he also expects to use it for personal travel, but if this be made inconvenient by lack of what he considers proper facilities, he will transfer his freight traffic to a road which is provided with adequate passenger train service.

To encourage settlement, and support the efforts of the emigration bureau, whose work is detailed in "Extraordinary and Public-Spirited Expenditures," there must be an adequate number of trains to take care of the prospective settlers. Such expenses, together with those of the department in reaching them and bringing them together, the transportation company expects an eventual return for, when the territory has sufficiently developed.

To Get Business. The passenger traffic department seeks to secure, not only its quota of travelers, but also a portion of those passengers who use the lines of competitors; the additional business is considered doubly advantageous, in that a fuller use of equipment, previously only partly availed of, is secured.

Rates play a most important part in the work and policies of this department. The constant effort is to reduce charges wherever feasible, but this action often results in demands for reductions in sympathy therewith on rates which have absolutely no connection with the particular one that has been made smaller. The general passenger agent of a Rail Road consequently must be conservative in authorizing changes.



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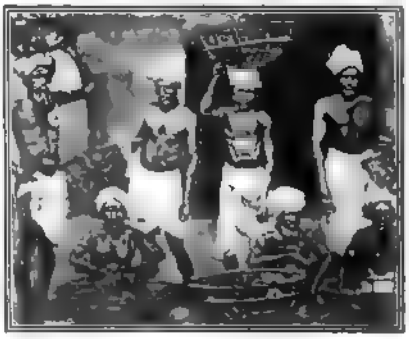
CALCUTTA CARRIERS. MODERN HUMAN BEASTS OF BURDEN

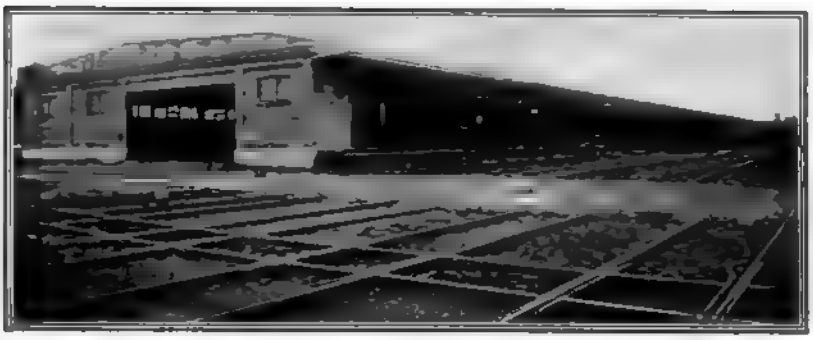


Freight Traffic.

The Value of Freight Traffic. Of the $2,418,677,538 which the Rail Roads of the United States took in during 1909, $1,677,614,678, or 69 per cent, was derived from freight transportation, $563,609,342 from the transportation of passengers, $49,380,783 from mail and $59,647,022 from express.

The traffic departments of the various Rail Roads, among

which the keenest rivalries exist, are constantly on a "peaceful war footing," with armed hostilities certain as soon as one road, in its eagerness to secure traffic, lowers a rate or offers special facilities in the shape of an extra fast freight service.



FREIGHT HOUSE, NEW ORLEANS.

The Freight Organization and Its Workings.

The Making of Rates. This department is directed by the general freight agent, upon whom devolves the important duty of making rates, subject to approval by Rail Road and the Interstate Commerce Commissions. For the purpose of securing traffic, there are assistant general freight agents, one of whom, for each of the great systems, is in almost every large city of the Union; these report daily to the general freight agent the transactions that they make.

The First Step. The first step in seeking to obtain business is to ascertain who the shippers are and where they ship, and the time taken and rates made by competitors.

Shippers cannot now be offered free transportation or rebates as inducements. The laws forbidding them have been for the best, helping the merchant by making it unnecessary for him to intrigue with one road against another, or use one road and its rates as a weapon against another, and helping the Rail Road, in that it gets its traffic paid for in full, good service being the principal demand made by the shipper.

Campaigning for Traffic. In selling freight transportation, plans are as carefully laid as for the most strategic war movements of a Napoleon.

Cities are divided into districts. Moreover, one man has charge of automobile traffic, another of pianos, etc., etc. They study catalogues and the make-up of the commodity, so as to be familiar with the wares and able to talk intelligently of them. A number of lines have as many as twenty-five men each for this service in New York City.

Long Shipments.

Western roads have many men in New York and other Atlantic points, for they secure a large amount of freight from the Eastern companies whose lines terminate at Buffalo, Chicago, etc.

This transfer, usually attested only by receipts of the delivering line, does not delay traffic appreciably. When a test was recently made, it was found that out of 15 cars shipped from New York to Chicago, and requiring transfer from one road to another, only one car failed to reach Chicago on the third morning.

Representatives in the West, being in touch with the buyers in that section, often wire to Eastern representatives of purchases made, which mean that shipments are to follow, which the representatives in the East try to secure.

Difficulties in Moving Produce.

Imported (?) Cheese.

The principal industry of Jefferson county, New York, on the border of Canada, is the production of milk for shipment to New York City. This county also contains a cheese factory, which is said to turn out 32 varieties of "imported" cheese. Other dairy products come to New York from even beyond Buffalo, 500 miles distant. These give an idea of the large zone of this product's movement.

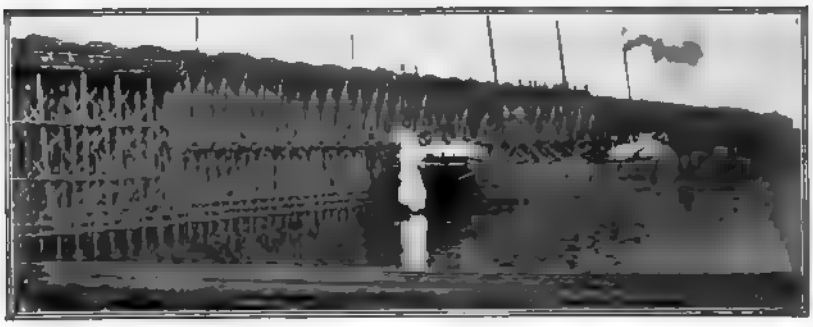
The next zone would be the grape and fruit industries of Ohio; then, the celery and kindred industries of Michigan; beyond these, the butter, egg and poultry industries of Indiana and Illinois, which also cross the Missouri river into Nebraska, Kansas and Missouri; the melon industry of Colorado, the fresh fruit industry of California, and the vegetable and fruit industries of the various districts of the South and Southwest, even as far as Rockport, Texas; finally, the fish and apple industries of Washington and Oregon.

New York City receives 600 freight cars of food daily, sufficient to make a solid train four and a half miles long.

Special Requirements.

The speed at which this traffic must be moved is a detriment to the movement of non-perishable freight, some of which runs on schedule, and some of which does not. Frequently, the fast freight trains are operated as second sections of passenger trains

A BUTTER AND EGG TRAIN IN THE NEW YORK



ORE DOCKS AT DULUTH, GREAT NORTHERN RAILWAY
FROM CARS TO BINS AND BINS TO VESSELS BY GRAVITY

Non-perishable freight usually is carried on the slower trains. Package freight, frequently being valuable, and as a rule needed promptly after being ordered, requires quick dispatch.

Fast Freight. Some particularly perishable freight, like milk, is forwarded on trains running 35 or 40 miles an hour. These milk trains usually are run as second sections of passenger trains.

Damage to Perishables. As perishable freight transportation is costly, rates are high. Complaints of this are frequent, but in the main are made without full knowledge of the conditions. The Rail Road assumes much responsibility, and if the goods spoil by delay or are injured in transit, heavy damages may be claimed.

To facilitate service, the car supply must always be adequate, and such schedule changes made as will enable the most rapid operation under constantly varying conditions.

The securing of shipments necessitates provision for their care and handling. The equipment and labor must be on hand when required.

Caring for Freight. Grain elevators, fireproof warehouses, sheds for protection from weather when loading and unloading, driveways, cranes, derricks, scales for weighing cars and packages, live stock pens, stables, icing stations, cold and heated storage, depots, and many other appurtenances must be provided. Large sums of money are saved to shippers by these liberal, even lavish expenditures of the Rail Roads, made to attract and facilitate traffic.

Many shippers remember when grain was shipped in bags, the cost of which was a heavy expense. To-day the great grain elevators are the reservoirs of our bread supply, as the reservoirs of our cities hold the reserve water supply. Grain can be shipped to and from them and be held and handled for a trifle of the cost of the old way

Elevators and Ore Unloaders.

The coal elevators or unloaders furnished by the Rail Roads pick up a loaded coal car, turn it upside down and discharge the coal, as one would empty a spoonful of sugar into a cup of coffee, effecting a saving that represents a large part of the cost of freight. In other cases, coal is handled on elevated trestles, and dumped into bins through the drop bottoms of the cars, and thence into vessel or cart, without manual labor.

$25,000,000 a Year Saved.

The great power ore unloaders are said to save approximately 50 cents a ton in the cost of handling ore. As it takes two tons of ore to make one of iron, this saves practically $1 upon every ton of iron—$25,000,000 a year from the old way of trimming and handling by manual labor. The handling of coal by the methods recited above, effects substantially as great a saving over the old way as do the modern methods of handling ore.

An enormous amount of money is invested by the transportation companies in these facilities, running into the hundreds of millions. These savings do much to add to the prosperity of the shippers, and in economizing, assist the progress of the country.

A GREAT COAL AND ORE HANDLER.

Operation of Modern Land Carriers.

The Rail Roads are the arteries through which the life blood of modern commerce pulses; they are the backbone and sinew of the body commercial.

The operating department is the motor center which exercises the great function of the Rail Road—the transportation of freight and passengers.

Where We Stand.

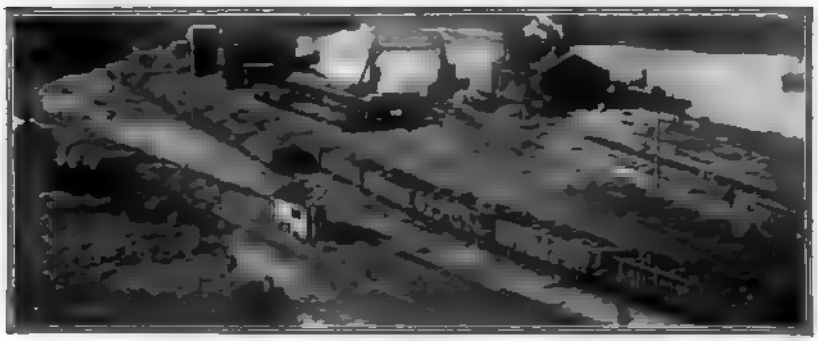
By far the largest percentage of labor is employed in this department, and on its handling of the Rail Way's business with the greatest practical facility at the lowest possible cost depends the position of the Rail Road in and to the community, as a successful business institution.

While the traffic department merely arranges for the transportation of a shipment from one point to another, and fixes the rates for that service, the operating is the executive department and must see to the execution of these contracts and the carrying out of the business. It must supervise the loading of the shipment, its carriage to destination, its unloading and delivery, seeing to it that the cost of these operations, including the handling of the equipment necessary for the transportation, is less than the charge made for the shipment.

Responsible for Much.

This calls for the highest skill, judgment, human organization, and the best possible physical equipment. Goods must be transported expeditiously and without injury, that the nation may not suffer by delay in marketing or the loss of its products.

Freight is consigned in two ways; one, in lots insufficient to make up a car load for a single destination, is called "less than car load lots," usually abbreviated to "LCL." The other way is in car load lots, "CL," which traffic is largely made up of heavy freight.



CARS AT AN ELECTRIC COAL DOCK.

In the Classification Yards.

When loaded, cars are switched to a "classification yard," where those destined for points along the same line or in the same general direction are made up into trains. If there be sufficient traffic, whole trains are made up to run to a destination without having to drop any cars. The cars are loaded according to the nature of the consignments. When not consisting of such commodities as grain or coal, which are loaded by means of chutes or similar arrangements, the freight usually is loaded into the car from drays, wharves, warehouses or platforms

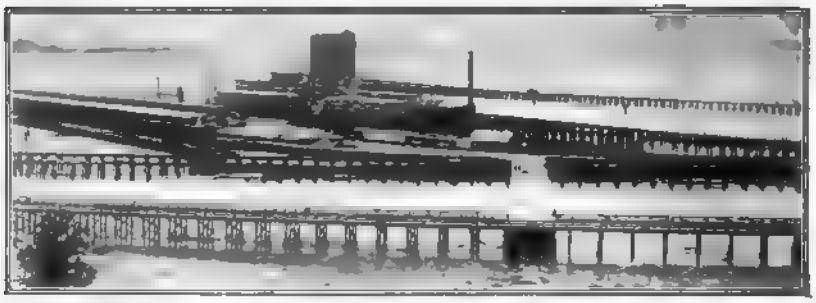
Where customers have tracks to their own warehouses or yards, the Rail Road's duty consists merely in switching cars to them. As a rule, none of the expense of loading and unloading devolves upon the carrier in such a case. When the loading of a car is completed, the consignor closes it, attaches his seal and then procures from the proper officer a bill of lading.

Handling Small Freight. A large amount of freight, principally "LCL" shipments, is received by the Rail Roads at warehouses equipped with platforms, upon which the freight can be piled and sorted; this often necessitates repeated handling of a shipment. A car may contain several hundred consignments of this freight.

The smallest load of miscellaneous freight which a car is supposed to haul is usually two and a half tons, but if the freight be moving against the tide of traffic—that is, in the same direction as the majority of "empties," smaller loads are permitted, enabling otherwise empty cars which must be moved, to bring in at least a small return.

Way Station Freight. Freight picked up at way stations usually has to be unloaded at the end of the division and reloaded into a car going in its direction. Sometimes freight has to be handled several times before the wares finally are placed in the car bound for its final destination, adding greatly to the expense of transportation.

Small consignments also are transferred frequently in order that cars may be emptied for reloading. The fullest employment of the carrying capacity of every car is important, especially in time of car shortage



GREAT NORTHERN RAILWAY DOCKS, SEATTLE

Switching and Yard Operation.

A Modern Institution. Our great and complex Rail Road yards are comparatively of recent origin. The early terminals handled comparatively few arrivals or departures of either persons or goods. Only with the gigantic commerce of recent years have the terminals developed to the size and complexity that severely tax physical, mental and financial resources, and call for the highest skill of the designing engineer. After their construction, they require the closest attention and application of the operating department.

The classification and terminal yards truly may be said to represent the capacity of the transportation company.

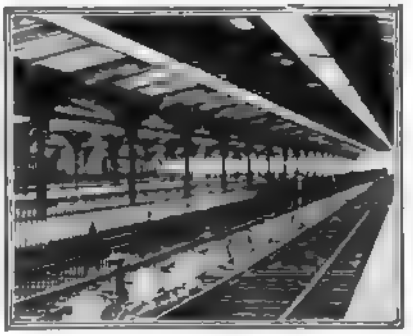
Specialization. A terminal with a great many miles of track is divided into divisions, each of which has its own function, especially in the parts devoted to freight cars. The freight division of a large terminal consists of a receiving, a classification, a departure, a repairing and a storage yard, at least three of which must be used by every car that arrives loaded and is dispatched with other traffic, the necessary loading and shifting in each yard consuming considerable time.

An idea of the complications which may ensue from the elaborated yard trackage can be gathered from the fact that as early as 1884 the yards at Buffalo included main tracks, those in passenger stations, freight side-tracks for freight trains from the West, from the East, from Canada, to Canada, distributing tracks for westbound freight, transfer, lake freight, coal, stock yards, storage, local city freight, shop and coaling tracks and others for miscellaneous purposes.

Accuracy Important. To some extent the distribution of freight cars resembles the distributing of mail by a postal clerk, but, if a letter misses its receptacle and falls to the floor, a moment's work corrects matters; if, however, a freight car be derailed, a large portion of the yard, and even the main tracks, may be blocked, with freight and passenger trains piling up every hour.

LOOKING OVER THE FREIGHT YARDS, TACOMA.

LACKAWANNA PASSENGER TRAIN SHED, HOBOKEN.



Terminals That Just Grew. Many important yards as they exist to-day are the result merely of adding tracks to the original yards from time to time. In consequence they are neither convenient nor economical, and are not up-to-date in their lay-out, being unable to perform the maximum of the work required by the traffic.

The best results in yard operation are secured where the trains enter on one side, passing on, always in the same direction, and leave on the other side. In the case of the New York Central terminal in New York City and in many cases in Chicago, trains are compelled to enter and leave on the same tracks, these being single-end or stub yards.

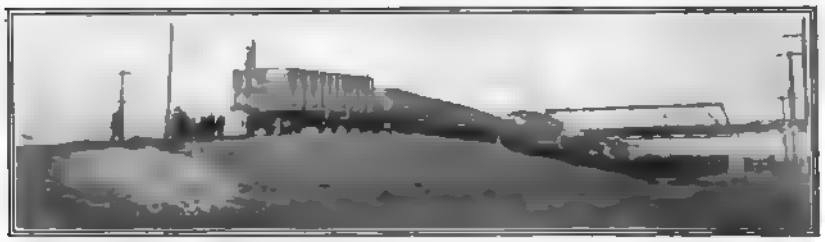
Sorting Cars. The cars must be carefully sorted according to their contents. A car of fruit cannot be made up in a coal or ore train. Live stock cannot go with low class freight that travels slowly and interruptedly. Refrigerator car products must go with other quickly moving freight. Therefore, the character of the freight has as much as the destination to do with the making up of trains.

Much "Drilling" Required. To get these trains together a vast deal of switching is necessary. At the freight house there may be immense quantities of miscellaneous freight bound for many different destinations, to load and assemble the cars for which require considerable work and time.

To get half a hundred such cars together on one track, picking them out from the host standing on the many tracks in the yard, opening and closing switches, shifting cars from track to track, and back again, avoiding accident, and bringing order out of apparent chaos, requires quick judgment and cool heads. Bear in mind that these cars come from many roads, and each must be selected for freight bound toward its own road.

Switching should always advance a car in the direction of its destination, but this principle is violated in the yards that make necessary the old-fashioned tail-end switching, with its see-sawing back and forth of a string of cars in classifying. This principle does not hold good when advancing them compels pushing the cars against the grade.

"Poling." As an improvement, poling has been adopted at many yards. The train to be classified is placed on an inclined track at the head of the classification tracks, and the switching locomotive running on a track alongside, pushes the cars into the classification tracks by means of a pole braced between the engine and the rear car.



A HUMP FOR SWITCHING

"Hump" Switching. A method only recently adopted bids fair to become the favorite. This is known as "hump" switching. By this method the train is slowly pushed over an artificial or natural summit, called a "hump," and the cars then toboggan down the incline onto the classification tracks. This permits of rapid work, but it is not as easy a process as might be supposed. Very powerful switching

engines, known as hump engines, have been adopted, for the hump means a heavy grade.

In the case of long trains, the engine may be half a mile away from the hump and the engine-driver must be signalled when to start, stop, or slow up, in order that cars may be uncoupled or weighed.

Time Lost. Again, the tracks are given a grade sufficient to carry the cars the full length of the tracks. A car rider must, therefore, accompany each cut of cars, and when his cut stops he may be a mile away from the hump, to which he must return.

A light switch engine running on an open track is frequently used to return these car riders to the hump, and it is even predicted that the near future will see trolleys used for this purpose.

Yards Between Main Lines. In order that switching and entrance into and departure from yards may be accomplished without interference with the main-line traffic it has become a practice in some of the smaller double-end yards to spread the main tracks far apart and to place the yards between them. Where this system is in use the through trains are run into that part of the yard which is nearest to the main track ultimately used for departure.

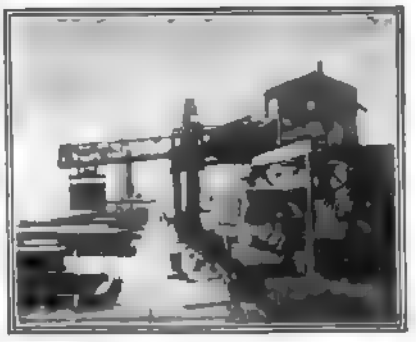
A Modern Yard. Modern yards often reach very large proportions. The classification yard of the Chicago Union Transfer Company has a capacity of 2,500 cars, which means seventeen miles of cars and room to shift them in.

The old Minoa DeWitt yard on the New York Central, a few miles east of Syracuse, the result of a gradual growth, proved incapable of handling the business. It was, therefore, redesigned and extended. The receiving, classifying and advancing tracks for trains in both directions lie end to end, hence the yard is five miles long.

There are nearly 643,000 feet of switching track, or almost 122 miles, and 625 pairs of switch points, or sharp rail ends, that are shifted back and forth when the switches are opened or closed. There is enough trackage to form a respectable Rail Road.

UNLOADING BY MAGNET

LOADING COAL FROM VESSEL INTO TRAINS.



THE SYRACUSE YARD, WHERE MANY TRAINS ARE MADE UP

The Labor Required in Making Up Trains.

Yard Traffic a Task.

Making up a train is something like getting a complete pack of cards out of many disordered packs —with each card as big as a house. Each card is a freight car, many of them capable of carrying 50 tons of freight and weighing of themselves, 20 to 30 tons apiece. All of these cars must be assorted by destination, by contents, and by ownership.

There are in the United States about 2,100,000 freight cars. There are about 80,000 Rail Road stations at which freight is delivered. Consider further that many of these cars are filled, not with one commodity, but with a large number of packages, which the Rail Road itself must put into the right cars. Multiply these items and see how many cards must be kept in sight and how they must be dealt out. Thus you will realize the magnitude and the complexity of the problem.

Many Yardmen Necessary.

One result of this complexity is that the number of yard and switchmen required to handle trains made up of cars containing varied loads for different destinations is much greater than that required to handle the same number of cars in through trains.

The army of 6,000 freight handlers and 4,000 switchmen employed in the suburbs of Chicago receive a total of about $25,000 a day in wages. One Rail Road in the vicinity of New York employs 4,000 men in its yards each day.

$81,000,000 a Year.

The 131,275 freight handlers and men around the stations in the United States receive a total of $81,000,000 a year. This number of employes does not include the station agents and trainmen, many of whom devote all or a large portion of their time to handling freight, who receive an aggregate of $112,000,000 yearly in wages. The clerical labor for the keeping of accurate records of the large traffic entails an enormous additional expense.

Extra Labor.

Cars disconnected from an engine must be braked by hand, since the air-brakes cannot then be used, and these hand-brakes are almost invariably on

top of the cars. Hence, while the classification is going on, there must be a man on each car much of the time.

Switch engines and their crews are compelled to run slowly in making up trains, and spend a great deal of time running to and fro and waiting, and constructively, they average only about six miles an hour running time.

Passenger terminals are much simpler than those used for freight; passengers enter the right trains and get on and off cars, and into and out of stations themselves, so that the simple provision of passageways settles a large part of the problem. Besides, there are few foreign passenger cars, or cars not belonging to the company itself, traveling on a road's lines, with the exception of Pullman cars.

Passenger Switching. As soon as a passenger train is vacated, its cars are taken into the yards by a yard engine. After cleaning and a general overlooking, they are switched to the storage tracks. After the new train is made up by selection from the storage track, it is shunted into the terminal station, where the road engine couples on.

ELECTRIC SEMAPHORE BRIDGE D., L. & W. RAILWAY TERMINAL YARDS, HOBOKEN

Train Dispatching and Train Movements.

No game of chess is more beautiful, interesting or perfect, than the handling of trains on a Rail Road.

A Man Among Men. The position of the trains dispatcher is an important one, on the absolute accuracy and intelligence of whose orders and their transmission depend the safety of passengers, employes, and freight, and the ability of the road to handle the largest amount of traffic. Few errors are made here, and if his orders are followed, collisions will be almost unknown

The first part of the work of a train dispatcher consists in scheduling regular trains, usually a comparatively simple matter.

When Complications Ensue. Let us look at the delicate and difficult side of the work. We will imagine that the dispatcher is in charge of a single track road with its stations named 1, 2, 3, 4, and 5. Train A, destined from 1 to 5, and train B, from 5 to 1, are supposed to pass at station 3.

If, however, the train dispatcher receives information that train A is at station 3, while train B has not yet arrived at station 4, he will give orders for train A to proceed to station 4, at which station train B will be held on its arrival until train A also gets there.

Making the Best of It.

Thus there is the least possible delay to the train which was on time at the originally designated meeting point, with the minimum of inconvenience to the train that, for some reason or other, did not "keep its appointment."

It may seem, from this simple delineation of one of his offices, that our statement of the train dispatcher's difficulties is slightly exaggerated; so it would be, were it not for the fact that the traffic of no road, except one of only the slightest importance, requires but two trains simultaneously, and in most cases, instead of five stations, there are from fifteen to twenty-five places at which trains may cross on a division.

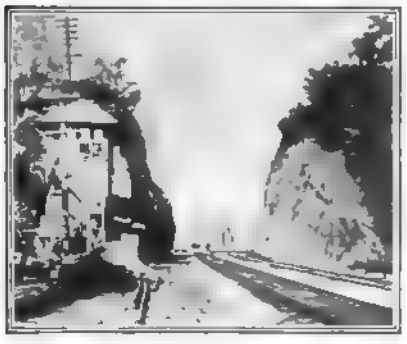
Variety.

Even on a single-track road it is necessary to provide for the passing of at least four classes of trains—freight and passenger trains going up the road, and both freight and passenger trains coming down. There may be local and through trains, freight and passenger trains traveling at differing speeds, to which are often added special and extra trains of one class or another, all of which have certain points at which they are to meet and pass or allow to pass, other trains.

A delay to any one of these trains will necessitate the giving of new orders to those that cross it, and, changing their schedule, perhaps compel a new set of orders to all the trains that are to meet them, thus causing a complete change in the operation of the entire road.

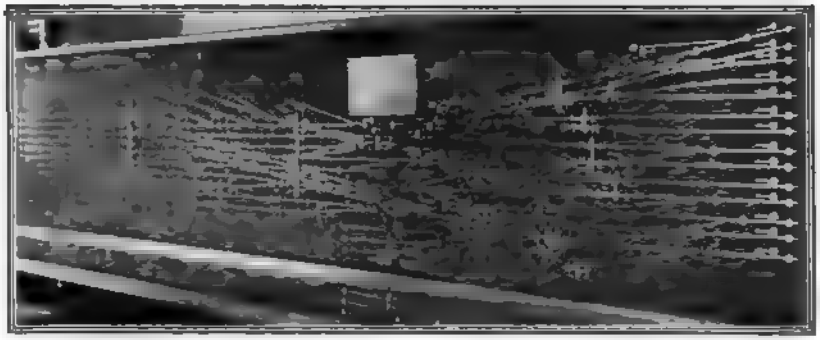
The Faithful Servant.

The transmission of orders for scores of trains, distributed over hundreds of miles of road, would practically be impossible without the help of the telegraph. But, though it plays so important a part to-day, its value for ordering trains was not even admitted by the Rail Roads until 1850. Then it was regarded as a luxury.



BLOCK SIGNAL TOWER, N Y CENTRAL

INTERLOCKING SWITCH STATION.



AN INDEX TO THE INTERLOCKING SWITCH INDICATOR.

especially where traffic was light, and its adoption only came about slowly. It is now gradually being supplanted by the telephone.

But as business grew, the utility of the telegraph to communicate quickly with train crews was realized. Its great usefulness made it an integral and pivotal part of the operating machinery.

An Exact Process. The superintendent or chief dispatcher can give his orders to the different trains by telegraphing to the stations which they are approaching at the time that he wants to communicate with them. Train arrivals and departures are scheduled on a time table, and trains on time have the right of way. Trains even a few minutes late have to keep clear of others until they get to a telegraph office for orders; this, of course, applies only to those cases where the other trains have superior or equal rights.

As traffic increased, the chief operator gradually became the train dispatcher. To-day there is a telegraph superintendent superior to him. The latter's control is absolute; he may alter the passing of trains, and even vary the running time.

When He Steps In. On arrival at a telegraph station, trains report nominally to the superintendent; in fact, to the chief dispatcher. For trains on time orders are unnecessary, but the moment one is late the superintendent takes control, or, in his absence, the chief dispatcher.

In many cases a large plotted sheet of paper is used by him. The location of the trains is charted thereon as they move from point to point, and thus he constantly knows the location of each train.

Fast and Slow. The rule in dispatching is to have the slow train take a siding whenever a fast one catches up with it, to allow the latter to pass.

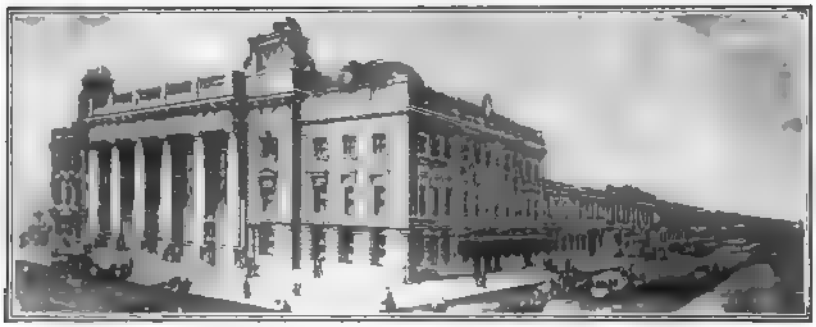
The engineer sits on the right-hand side of his engine so that he can see his signals clearly, while the throttle, the reverse lever or bar and the air-brake lever are all at his hand on that side of the cab.

When a train makes an unscheduled stop, brakemen are sent out far enough to signal and halt any train that might be coming, to prevent accidents.

Train Orders. To fix responsibility and eliminate excuses, engineers and conductors are required to acknowledge the receipt of train orders in writing and to read them to the operator and then aloud to each other, and frequently also to the fireman. The conductor and engineer must also compare watches before starting on a trip.

To-day the dispatchers of most of our important Rail Roads are helped by the block or automatic signals, described briefly in the chapter on signals. It enables engineers to tell whether the section of track ahead is clear or not.

Organization. A Rail Road is usually cut up into divisions of 100 to 150 miles each, although they are sometimes longer, and sometimes shorter. At each division headquarters the superintendent or chief dispatcher is assisted by four train dispatchers and one telegraph operator for each dispatcher. Each of three dispatchers is on duty for a period of eight hours; the fourth is held in reserve for emergencies.



C. & N. W. STATION, CHICAGO. THE OLD STATION AT THE LEFT.

Freight and Passenger Movements.

Recently the Illinois Central ran 316 suburban and through trains in and out of Chicago daily, carrying an army of about 60,000 passengers; the Northwestern had 280 trains daily, carrying the equivalent of 38 regiments of passengers.

Immensity of the Business. At the Union station alone there were 250 train arrivals and departures daily which trains carried 30,000 passengers. The LaSalle street station, used by the Rock Island, Lake Shore, and Nickel Plate, accommodates 180 trains daily, carrying something like 15,000 passengers. The Dearborn street station accounts for a like number of arrivals and departures daily.

The Freight at One Point. One thousand freight cars pass across the Northwestern's bridge at Chicago daily. The Chicago Car Service Association annually handles over 2,250,000 cars, so that practically every freight car in the United States passes through its hands every year.

A single Chicago mercantile firm ships an average of about 3,500 lots of merchandise daily, averaging two and one-half packages to the shipment, a total of 8,750 packages.

A Flood of Traffic.

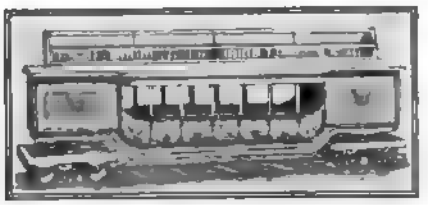
The Missouri Pacific, a single-track line to Kansas City via St. Louis, at one time not long ago, when a flood inundated the roadbeds of most other lines, handled practically all the traffic between St. Louis and Kansas City, besides a large part of that from St. Louis destined for Chicago.

On three successive days the road handled respectively 167, 166 and 183 trains, a total of 516, of which as many as 375 were passenger trains, with all the special requirements of that class of traffic.

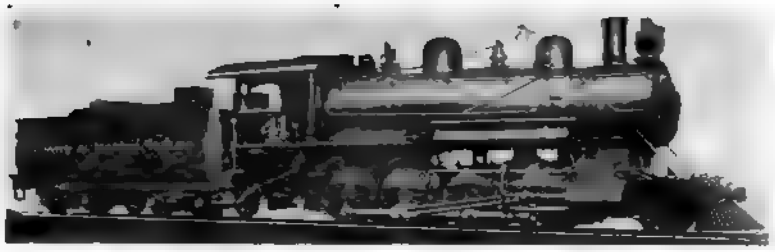
63 Trains an Hour.

The Pennsylvania Rail Road handled an average of no less than 1,533 passenger trains every day in the month of August, 1909. This is exclusive of the large freight traffic, which in the case of this road, requires an enormous number of additional trains.

It may be interesting to note that while this number of passenger trains is being handled already on its lines, the Pennsylvania is preparing for a capacity of no less than 1,450 trains daily through the single station being built in New York City.



FIRST CAR WITH RAISED ROOF, PHILADELPHIA & GERMANTOWN RY., 1836.



SECTION XX.

TRUSTS AND TRUST BUSTING.

The Steam Roads as Trust Busters.

The transportation companies of the United States are popularly credited with having been closely allied with the trusts. The impression generally exists that they fostered many monopolies, if they did not actually call them into being.

The Facts. It may be true that at one time, by means of rebates, some Rail Roads were instrumental in adding to the profits of one great trust, and perhaps of a number, but facts seem hardly to warrant the assertion that Rail Roads to-day generally assist in creating or maintaining trusts.

The writer will quote sample occurrences in his own experience which seem to show that the Rail Roads of the United States, whether so intending or not, are automatically and have been actually and directly greater local "trust busters" than all the attorneys-general, district attorneys, legislators and anti-trust laws combined.

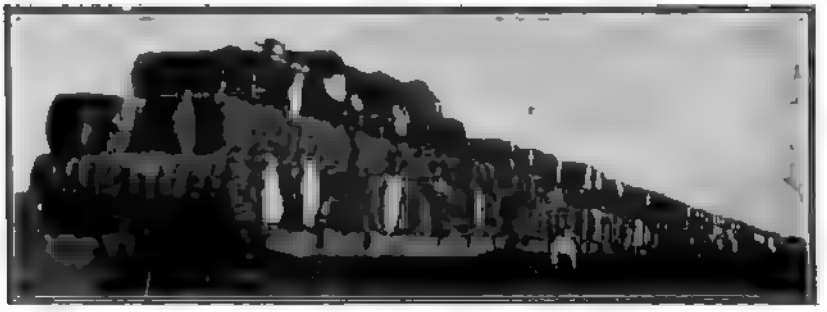
Bricks. Not long ago the writer was engaged in a matter requiring many million brick, for use in a prominent Western city. The brick manufacturers of that vicinity, thinking they saw a good opportunity for a large

profit, got together, and when asked for bids, uniformly demanded a very stiff price.

The writer then looked about for other sources from which to draw the necessary supply. The result was that he placed a large part of the order in Chicago, more than 250 miles away, securing the brick at a price sufficiently below that asked in the city where he was building to effect a substantial saving. Then the local manufacturers quickly changed their position and begged for a part of the order at much more reasonable prices.

Contrary to Belief.

It would seem impossible that bricks, which weigh eight pounds apiece, and are worth only from $8 to $10 a thousand, or, by weight, only a few dollars a ton, could be purchased several hundred miles away, freight paid for the intervening distance, and the brick delivered for a total outlay of less than was asked by local dealers, who could deliver them from brickyards in the city's suburbs, within teaming distance of the point of use.



PART OF A TRAIN OF COTTON, OKLAHOMA.

A Trust Busted.

Thus the Rail Road aided in destroying what practically was a monopoly. In a larger sense, and when applied to other lines of business, such a combination would be called a trust.

In placing orders for hydraulic cement for use in the same city, it was the practice to take bids and get quotations from every section of the country. Not 25 miles from the work there was one plant making a good cement, yet orders were placed sometimes in the Lehigh Valley, Pennsylvania, nearly 1,000 miles away, in Michigan, 300 to 400 miles distant, and in Kansas, several hundred miles away, at lower rates than the plants in the immediate vicinity would furnish it for.

Yet cement is heavy, and is worth only $1.25 to $2 per barrel, so that freight charges may reasonably be supposed to play an important part in its cost.

Lumber.

The same was true of lumber. Some of it came from Louisiana, and some from Norfolk, Va. It was bought at these distant points, and delivered with the freight paid, cheaper than offered by local or nearby dealers.

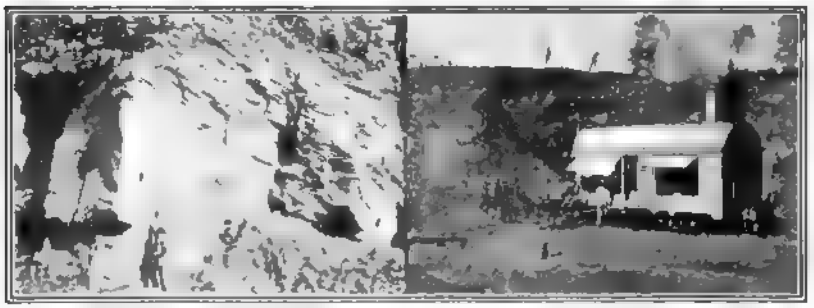
The Nation's Products in the Nation's Markets.

In recent observations in the suburbs of New York and other Eastern cities, the writer has noticed that most of the new frame houses are being weather-boarded with lumber from California, Washington and Oregon, on the other side of the country, showing that lumber from the Pacific coast competes with that of the Atlantic, even upon the Atlantic coast, and though it is railed all the way across a continent.

A Single Market.

The great interior and largely central city of St. Louis contains the greatest hardware concern in the world, the Simmons Hardware Company, which has its salesmen and sells its goods in every state and territory of the Union, from coast to coast, and from the lakes to the gulf. This is an illustration of the fact that an individual in any locality can expand his business indefinitely if his goods can meet competition in quality.

The manufacturer of almost every city sells his products in all parts of the country against home competition. For instance, the clothing manufacturer of Baltimore sells his wares in Rochester, and the clothing manufacturer of Rochester sells to the retailer or jobber in Baltimore, both selling in New York and the manufacturers of New York selling in each of the cities named.



IRON ORE OUTCROP BROWN IRON ORE DEPOSIT

A Non-Important Factor.

It therefore appears that the freight rate is at such a minimum that it has little debarring influence on either the price or trade. Not alone of clothing is this true, but the ability to freight cheaply enables the merchant or manufacturer in almost any industry, save those dealing in the heaviest of the cheap goods, to trade and compete with his rivals practically all over the United States.

Alabama Iron.

The pig iron of Alabama finds its largest market in Chicago, against Michigan iron ore, smelted in Chicago's suburbs. Recently the Bethlehem Steel Company, located little more than 90 miles from New York City, obtained an order for 5,000 tons of structural steel, to be used in

BETHLEHEM STEEL CO., 1900.

Chicago, a thousand miles away, against the competition of the steel mills located near Chicago and at many other intermediate points.

Minneapolis flour is sold throughout almost all our wheat-producing sections.

Ingenuity, good wares, business ability, energy and skill or even good taste, because of the nominal modern rates of carriage give to the wide-awake trader or manufacturer abreast of the times, no matter in what section of the country he may be, opportunity to do business almost everywhere else.

Exchange. The cotton manufacturer of New England brings his cotton from the South, manufactures it and ships some grades of it back, to be worn perhaps by the family of the very man who grew the staple.

How the trans-Allegheny, or even the trans-Mississippi, or Southwestern farmer, fruit or other producer sells his products in the East, and exchanges with the boot and dry goods manufacturer of that section, needs no reminder.

Unlimited Trade. The apple orchards of Oregon and Washington, and the orange groves and vineyards of California, have their products marketed in almost every city and hamlet of the country. The product of the factory worker who buys these delicacies in the small town of the

PICKING APPLES FOR EASTERN MARKET, OREGON

East or elsewhere, is likely to find a return market and consumer in the cities of the Pacific coast.

The Great Levelers.

There are few better examples of the Iron Roads as broadeners of opportunity and developers of natural advantages, as creators and encouragers of trade, and as "busters" of locality-created trusts or combinations, no matter where found, who convert what would otherwise be neighborhood industries into national plants.

There are trusts which survive to-day, but they are monopolies which practically control the entire output of a commodity, or its distribution. The low rates on our Steam Roads certainly serve to create rivalry and invite the entry of the active competitor practically everywhere in the United States.

DATE PALM AND FIGS, TEXAS.
THE RAIL ROAD PUTS THE PRODUCER IN TEXAS IN TOUCH WITH THE CONSUMER IN MAINE

DOMESTIC TRUST BUSTERS.

Rail Roads and the Cost of Living.

Trust Busters.

We have just dealt with the Rail Roads as trust busters in the generally accepted sense of the word. Let us now draw closer and see how modern carriage affects us even more personally and intimately in busting trusts from the householder's point of view.

Axiom of Economics.

Since the earliest days of history prices have practically been governed by the natural law of supply and demand, which is subject to the total cost of obtaining, preparing and distributing the supply.

Frequently, in the days before the adoption of the Railed Road, there were, as now, complete or partial failures of local crops of fruit, vegetables, grain or other products. These were the result of too little or too much rain, early frosts, attacks of insects, blights, hot winds, tornadoes, hail, etc.

The Why of High Prices.

The expense of shipping the amount of supplies which the district affected needed in such a contingency was so large, that in those cases where they could be brought at all to relieve the distress, their cost became abnormally high.

An illustration of the inconvenience and high prices which the Rail Roads were expected to do away with, is furnished by an article published in New York City in the winter of 1832, in favor of the building of the Erie Rail Road. It said:

MODERN FARMING. A CONTRAST WITH OLD METHODS.

Salt, $2.50 Per Bushel.

"It (the Erie Rail Road) would prevent a recurrence of the state of things which now exists in the city of New York. There would not then be, as there are now, thousands of barrels of flour and other kinds of produce in proportion frozen up in canal boats and in sloops on the Hudson; salt would not be now selling in Albany for $2.50 per bushel, and pork at $2 per hundred for want of salt to save it, whilst pork is worth from $5 to $7 in this city.

Coal $15 Per Ton.

"Coal would not then sell here for $15 or $16 per ton; nor oak wood at $9, and hickory at $13 per cord, as has been the case for two or three weeks past, if Rail Roads were in general use; but all kinds of business would move on regularly, and be more equally divided throughout the year. Produce could come to market as well in January as in July; and the farmer would not be obliged, in order to get his crop to market in the fall, to neglect preparing for the next season's crop."

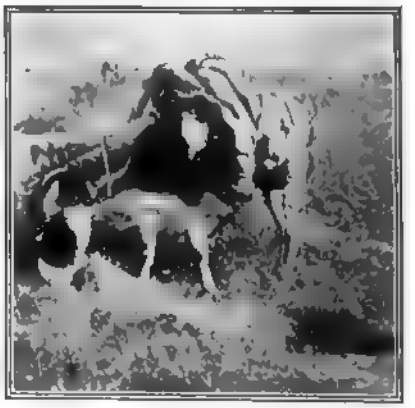
To-day a crop failure, unless very extended and general, has but a passing and usually only slight effect on the price of the commodity in any section of the country, even in that most directly affected, for the common carriers quickly transport the required quantities of the foodstuff to the region in need, holding prices to substantially the same level as elsewhere.

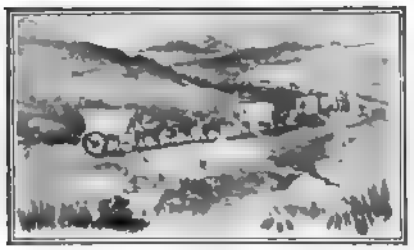
Prevents Waste. Our inland transportation systems have done more than this, however; they have helped not only the buyer, but the seller, for they have been equally as active in times of over-production, as in times of famine; as helpful when local markets were congested as when they faced shortages in supplies.

In olden times, the crops in some cases rotted in the fields when there was local over-abundance, or lack of local demand. Now they find their way to the Rail Road stream, on which they are floated to even the most distant points of the country.

In the days before the Rail Roads, the millions of uncultivated acres in this country, "sterile with idleness," contributed naught to man's needs. At the same time large sections of Europe and other continents suffered for bread.

BURROS WERE THE FREIGHT CARRIERS OF THE SOUTHWEST.





A WESTERN WAGON TRAIN
PRIMITIVE TRANSPORTATION PREVENTED THE EXTENSION OF TRADE.

Sterile Lands. Untilled and non-productive land occupies the same economic position to the community as the closed factory, and is equally useless and unprofitable. Even had the land borne the fullest fruit of golden harvests, it would have been a practical impossibility in those early days of the past century, to transport them to the consumer within the range of practical cost, however great his necessity or requirements.

In the interior of Alaska to-day there are places where beans sell for from 18 to 20 cents a pound, sugar from 25 to 30 cents a pound, flour from 18 to 20 cents a pound—which means $35 to $40 a barrel—and ham 60 cents a pound.

An Abnormal Situation. Now, while labor in such parts of Alaska may be paid from $5 to $8 a day, the actual cost of feeding the man is said to be in some cases $3 a day. It is obvious that nothing but the Klondike's bonanza gold camps could support such food costs.

As a notable illustration of the manner in which improved transportation affects the cost of living, it may be recalled that, at

the time of the Yukon gold excitement, as high as a dollar a pound, or $2,000 a ton, was charged merely for packing goods over the few miles of the White Pass, to Lake Bennet, and the cost from Skagway to the upper Yukon was just short of being prohibitive.

The Rail Road's Help.

When the White Pass & Yukon Rail Road was built, transportation costs were reduced to a fraction of this charge, and to-day freight can be transported over the White Pass to Dawson from Seattle, 2,000 miles away, for $55 a ton, or two and three-quarters cents per pound.

A Rock Island passenger locomotive

Field, Farm and City Prices.

Squaring Things Up.

As actual, practical proofs that new transportation tends to equalize the wholesale cost of food products in every section of the land, the reader need only acquaint himself with the prices of standard necessities in the principal wholesale markets and at the places of production.

The wholesale price of butter in Elgin, Ill., from where much of New York's choicest butter comes, need be only three-quarters of a cent per pound less than to the retailers of New York City, a thousand miles away, the three-quarters of a cent being the Railed Road's freight charge

One Price for Bread.

The wholesale price of a barrel of flour in Minneapolis, practically in a corner of the very field in which the grain is grown, is only about 50 cents less than the cost of the same barrel in New York City after being shipped about 1,500 miles by rail.

Such a transportation charge does not increase the price of the individual loaf, when a barrel of flour is converted into hundreds of loaves of bread. The five or 10 cent loaf of bread made from this barrel of flour is practically of the same weight in every corner of the United States.

The wholesale cost of dressed meat in New York need be less than a half cent per pound higher than in the great slaughtering and stockyard centers of Chicago and Kansas City, for one-half to two-thirds a cent respectively is all that it costs to carry it the intervening distance.

The Cause of the Increase.

So, if there be any grave difference in the cost of living in the various sections of the country, it appears to lie in the middlemen's profits rather than in the cost of transportation.

Wages, as a rule, are higher in our cities than elsewhere, but if it were not for the retailers' or middlemen's profits, living costs, outside of rent, need be only a fraction more than elsewhere, because of the inconsiderable cost of modern land transportation.

Competitors.

Many farmers and those in small villages make their purchases of the necessities of life in the large cities, to avoid excessive prices on the part of local dealers. Two mail order houses in the single city of Chicago are said to do an annual business of nearly $100,000,000 directly with the consumer, using our great modern steam delivery wagon service.

This competition is a safeguard against local retail exaction, as the retail dealers have to make their prices reasonable to keep their business.

Thus does modern transportation seem to act as a further natural safeguard against local or artificial monopoly in any section of the country.

Its Working.

Commerce to-day, like air and water, spreads in every direction. It is said that nature abhors a vacuum, and progressive prosperity seems to have the same failing, for merchandise or food products to-day are rushed in by modern transportation wherever there is need for them. Though prices may be momentarily fractionally higher, the want is filled so quickly that the cost is reduced to normal.

It is hard to find any greater price-leveling agency or protection, or an anti-monopolist more worthy of the title of "domestic trust buster" than modern transportation. There is no greater safeguard against extortion or excessive cost of living than the steam horse and the road of rails, which enable us, if we choose, to get what we want, from almost anywhere, at a transportation cost of a mere fraction of its value.

A MODERN MOLE. AN ELECTRIC MINE LOCOMOTIVE.

A BRAKE ON THE WHEELS OF PROGRESS AND PROSPERITY.

Cost of Carriage Not Responsible for the Increased Cost of Living.

Low Prices to Producers.

Agencies other than the cost of carriage seem responsible for the increased cost of living, and for the fact that the cost of food supplies is greater in New York City than in Panama, where the canal diggers receive food through the commission stores at low cost, because the Government has established markets and created a cold storage steamship and train service.

Many freight rates in the United States to-day are lower than 10 years ago. We have given figures elsewhere to show how small a proportion of the cost of goods is added by freight rates.

Combinations of Commission Men.

The Gravest Menace.

In our larger cities there are trusts and combinations of commission merchants and middlemen, which, receiving but passing attention, yet constitute the gravest menace to the producer as well as to the consumer, and to combat which is most difficult.

The Parasites of Commerce.

The men who intervene between the grower and the consumer, levy tribute on each. They are not buyers; they are not sellers for their own account. They merely accept the farmer's goods, dispose of them, collect the proceeds and remit what they please to the grower, who must accept the commission man's word as to the price at which the goods were disposed of.

In New York City alone, $28,000,000 in butter, $25,000,000 in eggs, 4,000,000 barrels of potatoes pass annually through the hands of these commission men, who seem not inaptly to have been dubbed "pirates." They handle, besides, millions of dollars' worth of fruits, vegetables, poultry, etc. It is estimated that New York's food bill is between $400,000,000 and $500,000,000 annually, and the appetite of New York requires a freight car of food brought in every 48 seconds during the working day, to satisfy it.

The figures merely hint at the richness of the commerce against which the commercial buccaneer raises his black flag.

How New York Pays Tribute to the Middleman.

The Widening Gap.

The New York World, on August 14, 1909, in an article on the increased cost of living, shows the big gap between what the producer gets and what the consumer, in New York City, pays for fruits and vegetables, tracing in an interesting way the manner in which the commission man gives "the double cross" to the farmer and to the consumer, "catching them coming and going," and getting an enormous "rake-off" from the $500,000,000 which New York is

GANSEVOORT MARKET, NEW YORK.

said to pay annually for uncooked food. "Of this approximately $225,000,000 is in excess of the primary wholesale cost price."

Banded Together.

The World shows that the refrigerator trust, the commission merchants' trust, the retail merchants' trust—all stand between the grower and the consumer, and it is these combinations that reap the profits and are largely responsible for the increased cost of living in our cities.

It is a matter of legal record that the New York commission merchants are in an association and deal directly with the farmer on the one hand and the retail grocers' association on the other hand.

The Dead Line.

The commission merchants' association and the retail merchants' association are said to get together and confer from time to time, giving the latter a powerful leverage over competing retailers who may try to cut prices, and affording the association retailer protection against direct sales to the consumer on the part of the commission men.

Here are the prices at which the commission men sold to members of the retail merchants' associations in August, 1909:

The Retailer's Investment.

Good to choice creamery butter, 24 cents a pound; choice fresh eggs, 25 cents a dozen; best full cream cheese, 13 cents a pound; beans, $2.50 to $3.00 a bushel (32 quarts); apples, $1 a bushel; raspberries, 5 cents a pint; currants, 6 cents a quart; blackberries, 6 cents a quart; cherries, 7 cents a pound; watermelons, $1 per 100 pounds; musk melons, 2 to 3 cents each; corn, 1 cent an ear; cabbage, 2 to 3 cents a head; peas, 50 cents a basket; string beans, 75 cents a bushel, and potatoes, $1.50 to $1.75 a bag of eleven pecks.

The farmer or producer was lucky, however, if after paying commissions and other charges, he received one-half the above prices.

What the City Dweller Pays.

While these prices were ruling, friends and office associates of the writer were paying 50 to 60 cents a peck for potatoes, 10 cents a head for cabbage, 40 cents a dozen for eggs, 38 cents a pound for butter, 10 cents apiece for cantaloupes.

It is not out of place to add that by November, 1909, the retail price of the best eggs had advanced to 55 cents, with 48 cents as the price for butter, while in 1910 eggs were as high as 60 cents a dozen.

Instances of the consumer paying from three to eight times as much as the farmer received are not unusual. The farmer nets for a musk melon little more than a cent or a cent and a half; the consumer pays five and very probably 10 cents for one.

The farmer receives as little as three cents a pint for his raspberries, which the consumer in New York purchases for 15 cents.

How the Chicago Commission Trust Works.

The Devil for the Witch.

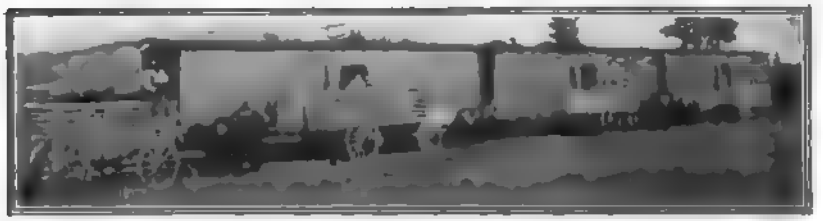
These practices are not peculiar to the New York market. They are duplicated in the Chicago market and in all markets of any size. The Chicago produce market is second only to that of New York, and the country shipper who changes from the Eastern metropolis to the Windy City in hopes of getting better treatment finds he has "swapped the devil for a witch."

After an investigation extending over seven months, Forest Crissey, in Everybody's Magazine for June, 1909, gave the result of his probing into the evils of the Chicago market.

Dick Turpin Tactics.

In a certain small town in Georgia, Mr. Crissey found several victims of the gentle art of separating the grower from his produce at the least possible cost to the operator.

A Chicago artist owned a fruit farm on the outskirts of this Georgia town. His brother-in-law, who operated the farm, wrote him that the finest lot of grapes that had ever been raised in Georgia had been shipped from the farm to the Chicago market.



LOADING CARS WITH FRUIT

and he mentioned the name of the commission man to whom the grapes had been consigned.

When Grapes Sell High.

The artist, anxious to please some of his friends, went to the commission merchant and, without telling him he was the grower and still the owner of the grapes, although he felt proud at reading his own stencil on the packages, bought a dozen baskets, paying one dollar apiece.

The commission man admitted the price was high, but said that the shipment was extra fine; that it was the only first-class shipment on the market, and that there was not an unsound cluster in the whole consignment.

When Grapes Sell Low.

A week or two later the farm manager wrote the artist, enclosing the commission man's settlement, which purported to show the shipment had been received in bad condition owing to the melting of the refrigerator ice and that it had been necessary to throw a large part of the grapes on the dump.

The returns were made on the basis of 25 cents a basket, with about six cents deduction from this for freight and commission charges.

When the artist called on the commission merchant and remonstrated, reciting the statement made to him by the latter when the artist paid a dollar a basket for the grapes, the modern pirate informed him that if those methods of business did not suit him, the artist might seek satisfaction in Hades, adding that he wished him to vacate the premises without more ado. And the artist went.

A Hint to the Wise.

Another shipper in the same Georgia town learned of this incident and determined to trap his commission man. He had a friend in Chicago and got him to buy outright an entire load of the Georgian's grapes, taking care to secure all necessary receipts to identify the car and shipment.

Then, when the commission merchant reported that the car had been "peddled out" at a low price, the grower took train for Chicago and he and his friend confronted the commission man; the grower not only made the commission man turn over the full proceeds, but figuring on the same basis how much he had been defrauded on previous shipments, compelled restitution therefor.

First, however, it was necessary to remind the commission merchant that the state of Illinois supports an institution known as a penitentiary.

Cheap Melons Prove Dear.

Another Georgia grower suffered so from this "knocking down" practice that he gave up melon shipping, permitting the best of his crop to rot in the field.

On one shipment of 18 carloads of fine melons he received $208 as his entire return: another car, shipped to Chicago, there tested and found in excellent condition, cost him in expenses alone $13 more than the benevolent commission "shark" remitted to him.

A South Dakota herd of cattle.

A Comparison of Prices.

Eggs. In many inland cities the price of eggs is regulated largely by New York City's market. A man formerly in the egg business in an interior city between 900 and 1,200 miles from New York, gave the writer these facts:

It is generally understood that only from one and one-half to two and one-half cents shall be deducted from the New York quotation in order to put the local market of the city in which this man lives on a parity therewith.

Sufficient Margin. This margin covers the profit of the local dealer, who has to supply cases, stand the incidental losses, pay freight of probably three-quarters of a cent a dozen, pay the New York commission man a half to three-quarter cents a dozen as a selling commission, and pay also such charges and expenses as drayage, labor, rent, etc., as well as being without the use of his money from the time he pays the farmer until such time as the New York commission man sees fit to remit.

That these items amount to a considerable total on five or six carloads a week, each carload running about 300 cases of 30 dozen eggs each, may be figured without a knowledge of integral calculus.

13c. vs. 40c. Notwithstanding the fact that in August, 1909, the farmer in the suburbs of the city approximately a thousand miles away, probably received 13 cents, while all the incidental expenses until its arrival in New York, amounting to 2 cents in addition, were paid by the dealer, the consumer in New York, as has been recited, paid up to 40 cents a dozen for eggs. Under the circumstances, there would seem no excuse for the 300 per cent advance in price.

Who got the difference? Hardly the transportation agency, for on each dozen eggs the rail freight was only three-fourths of a cent.

Freight Rates. In our article, "Are Freight Rates Reasonable?" and elsewhere, we find that the steam carrier's charge adds a third of a cent a pound to the cost of meat hauled a thousand miles, that it adds only two cents to the cost of all the vegetables that a family can eat, and but one cent to the cost of six cans of fruit or vegetables.

Freight rates apparently play so small a part in the item of cost that it is impossible to find in them such tremendous differences as we have shown to exist between the prices received by the farmer and paid by the consumer.

Butter and Cheese.

A custom of the New York City Butter and Cheese Exchange was severely denounced by Governor Hughes' investigating committee. To the credit of a handful of members it must be said that they fought the practice and were responsible for much of the "inside information" that was developed.

This exchange had a committee which fixed the prices of butter and cheese. And "fixed" seems the right word in the right place in this instance. On occasions it would fix a high price and members would then send out asking for shipments on the basis of this "Exchange price."

On the Price Toboggan.

After shipments had been made to the members of the Exchange, the price often dropped several cents a pound, so that by the time the butter and cheese reached New York, they encountered the new low price, instead of the old, higher quotation.

The milk situation is another instance of the manner in which the farmer is "trimmed," and the consumer "held up."

The $30,000,000 milk trust in New York City allows the farmer an average of about $1.30 gross, for a 40-quart can of milk. Out of this come various deductions, reducing the return to the farmer to about 67 cents.

An Advance of 500 Per Cent.

The city consumer is cheerfully paying the milk trust 9 and 10 cents a quart, or at the rate of $3.60 to $4.00 for that which nets the farmer 67 cents.

At the same time so-called "certified milk," secured in sanitary surroundings and bottled under hygienic conditions, is retailed in the city for 10 cents a pint, or 80 cents a gallon, and butter from fancy dairies retails at a dollar a pound.

In November, 1909, the Milk Trust raised the price of milk one cent per quart and cream eight cents, basing the increase on an alleged raise in Rail Road freight rates. Investigation revealed that almost a year before, the Rail Roads had abolished a certain allowance or reduction, and this constructive increase added a trifle over one and one-half mills to the cost of each quart of milk or cream.

Freight Blamed.

Therefore, the Milk Trust taxed the people almost seven cents, or 700 per cent, for each extra cent paid out on milk freight, and almost 50 cents for each cent on cream.

The milk trust is only a distributor, for, as stated, the cost of transportation and handling right up to the point where the milk is ready to be put into bottles, falls on the farmer.

What the Steam Roads Have Done for Farmer and Consumer.

First Interests. The primary interest of the public carrier as a business is naturally and necessarily with the producer, for production means freight; it should be remarked the Rail Road has no interest in prices or the profits of others beyond its natural desire to secure for the nation at large a prosperity in which it may participate.

They would naturally be glad to see the consumer buy liberally, and in the largest quantities, everything that can be raised, manufactured, or converted into an article of commerce and trade. It is safe to say they are ready to aid both the producer and the consumer wherever they can, rather than the commission man, who produces nothing.

The Pennsylvania Rail Road, since 1906, has been conducting a development campaign in behalf of southern New Jersey's agricultural interests.

Transportation Has Changed a Hunting Ground into the World's Granary.

Emancipating the Farmer. Commission merchants and buyers all over the country have been supplied with lists of reliable growers and shippers of that section, whose market has widened greatly. In addition to enabling the farmer to market his products quickly and broadly and to secure the best prices, special train schedules have been established and "preference" freight trains have been operated, which have right of way over all other freight trains.

In one month 3,000 cars were sent out from New Jersey over a large part of the country, as far as Maine, Illinois, Michigan and Canada.

The South. As a result of similar work by the same Rail Road, fresh Southern fruits and vegetables were brought within reach of residents of small cities and towns in the Northern states all winter In one recent year 70,000 freight cars were used by the Pennsylvania in handling this traffic.

A few years ago fruits and vegetables from the South were consigned direct to New York and Philadelphia, where the dealers of surrounding towns were obliged to buy, paying extra freight or express charges to their own towns. Owing to the loss result-

ing from the extra transit time and extra handling prices were high and few could afford to purchase early vegetables and fruits.

The Carrier Gets Busy.

The Pennsylvania then became active, and by giving all places within a radius of 50 or 100 miles of New York, Philadelphia, Baltimore, Pittsburgh and Buffalo the same rates as the larger cities, almost every dealer in Pennsylvania, New Jersey, Southern and Northwest New York, Maryland and Delaware was put in position to have carloads of perishable goods consigned direct to him without paying the rate to the larger city plus a local rate to his own town.

This policy has vastly increased the winter traffic in perishable goods, extended the area of consumption and has enabled the South to increase its production enormously without overstocking the market.

WOMEN LOADING BANANAS, WEST INDIES.

The Remedy.

The Primary Remedy.

The primary remedy appears to be in the hands of the farmer and producer, the first victims; if they break away they emancipate their brother victim, the long-suffering consumer, who is in such a peculiar position that individually he can do little if anything.

The commission man plays a safe game. He gambles with the other fellow's money or products, and takes the gains, as well as the rake-off, stacks the cards, cheats, and freezes out the consignor.

The Commission Man's Defense.

The produce man does not seem to deny the charges of sharp practice—to use no uglier word—but, in defense of himself, says that the retailer is the real "hog," who insists upon from 50 to 200 per cent profit, and that the retailer's profits on potatoes alone should make him a "millionaire."

"And in the Meantime."

"And in the meantime" the farmer works and sweats and gets the worst of it; the hungry factory or city worker swears at the farmer, high prices and hard times, and has a flat purse before the week end.

And, also "in the meantime," the middleman smiles and fattens, and licks his chops complacently, while digesting both canaries.

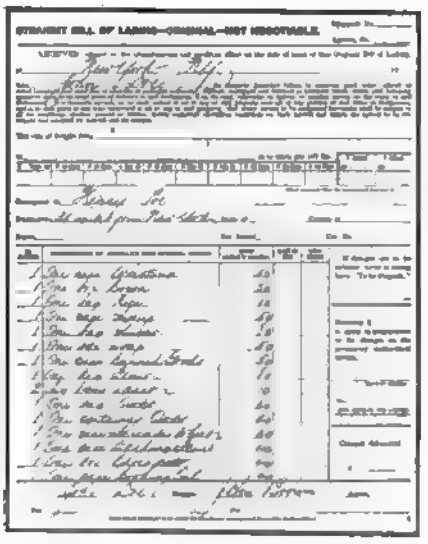
The logical thing seems to be for the producer and consumer to get together, and then, with the modern carrier's aid, they will be in a position to wage effective warfare against the low prices received by the son of the soil for the produce of his husbandry, entirely out of proportion to the prices paid by the consumer.

The press can aid also by constantly publishing wholesale prices of articles of food, so that the buyer may know whether or not the prices he is paying are reasonable.

The Steam Roads' Contribution to Credit.

The Bill of Lading.

A forceful factor in the commercial affairs of to-day, and in our progress and prosperity, and one which has contributed to and amplified the credit of the nation and its people, is the Rail Road bill of lading. This name is frequently abbreviated, in mercantile parlance and correspondence, to "B/L." We give herewith a reproduction of it on a small scale.



It is a powerful adjunct to and a formidable lever of progress and prosperity, enabling them to forge ahead of and beyond the restraint which insufficient money and an inelastic currency system have placed upon them.

A Negotiable Instrument.

The convenience and widespread use and benefit of this document are not generally understood. It is, in brief, a receipt from the carrying company for certain goods delivered into its care, and this receipt may be made negotiable and transferred from hand to hand.

It is regarded as prima facie evidence that certain specified merchandise or goods are in the hands of the Rail Road company. The bill of lading may be considered proof of ownership, almost as clear and as perfect as the deed to a house or a piece of property.

Obtaining Loans. Loans can be obtained upon it more easily and quickly than upon even real estate or mortgages, if the goods covered by the bill be hay, corn, wheat, coal, iron, cotton, cattle or any other commodity readily salable, or with a ready market value. It is more easily transferable than the goods themselves, and when covering certain classes of goods is almost like a bank note.

The "order" bill of lading differs from the "straight" bill of lading in that it is specified that the goods are to be delivered, say, to "John Doe or order." The order bill of lading, like a check payable to an individual, is understood to carry with it the title to the goods, which are deliverable on presentation of the bill of lading properly endorsed. The ordinary bill acts merely as a receipt to the consignor, the goods being deliverable to the consignee only.

Free Warehousing. Pending the presentation of the bill of lading by the merchant for whom the goods are destined, the Rail Road, without charge, acts the part of a warehouseman, safe depository or trustee to the particular benefit of the trader, and to the general advantage of the commerce of the country.

Many merchants use the Rail Road bill of lading for a carload of goods just as American or foreign merchants use their bills of lading on the cargoes of ships, and draw against them to raise money enough to pay for the cargoes or the handling of them.

How It Reads and Its Origin. The Rail Road bill of lading describes the car, its number, the line to which it belongs, and the quantity and nature of its contents. The ship's bill of lading in the same way describes the vessel, its name, etc., and also the quantity and nature of the cargo or consignment.

The bill of lading was originally the list of the contents of the outgoing ship, a sort of general inventory, showing the quantities, owners, consignees, values and all other pertinent facts about the cargo.

Forging the Links in the Chain of Credit.

The buyer or dealer in any small town to-day purchases a certain quantity of the commodity in which he deals. He may then sell his purchase by telegraph, telephone or letter, or consign it to the grain elevator, to the merchant in some near or distant city, to the cattle commission man in a packing center, or to a New York or even a Liverpool cotton house.

The Chain of Credit. He obtains authority to draw against the consignment, and the bill of lading covering the shipment is deposited by him in the local bank with a draft for the amount of the selling price. This the bank

discounts for him, or advances to him a part of it, the cash enabling him to complete his purchase and pay the seller, the bank taking the bill of lading as its security.

The local banker then forwards the bill of lading, with the draft attached, to the banker who acts as his correspondent at the destination of the goods. The correspondent presents the draft and bill of lading to the consignees, who may already have sold the shipment and arranged a credit in their own bank by drawing on somebody else.

Working It Out.

When the draft is honored, the bill of lading is turned over to the consignee and the money is remitted to the bank in which the consignor deposited the draft and bill. The bank then deducts the amount it advanced and turns over the balance to the shipper.

The bill may be transferred several times and several drafts may be drawn in the same way, as links in the chain of credit.

In this way our common carriers have been almost invaluable factors in augmenting credit, have provided valued commercial facilities, and have been important media in the enormous growth of the trade and wealth of the nation.

A WAY BILL.

Aiding Local Enterprise.

The bill of lading is daily used as the basis for such transactions at all shipping points, large and small, throughout our farming, producing, commercial and manufacturing sections.

The local cattle dealer, grain or cotton buyer need no longer be a man of means with great credit or capital. And the farmer or producer may, if he wish, and frequently does, eliminate the middleman, and sell or consign his goods himself, using the bill of lading as the middleman would.

Trust Busting of Buyers.

Generally speaking, a few hundred dollars, a good name at one's bank, and knowledge of markets is sufficient capital to-day for a profitable and active business by a local dealer. Time was when buyers were limited to men of large capital, and these few not infrequently got together and kept down prices to the detriment of the local seller or producer. The bill of lading has been a trust buster of buyers, and a protector of the seller, aiding him in securing competition and the best price for his goods.

C. O. D. Freight.

Protecting Credit.

The bill of lading acts likewise as a basis for many cash transactions. It enables the merchant or the manufacturer to deal safely with a customer at a distant point or abroad, even with one of whose credit he may have no rating or definite knowledge, for if so specified the bill of lading does not carry title until the money called for in the draft attached, is paid.

It makes possible a C. O. D. business by freight, without expense; and sometimes, if exchange be in favor of the consignor's locality, there is a small profit on the money involved, as well as that on the goods.

Complications.

Each of our Rail Roads for years had its own form of bill of lading, and few forms were identical. As a consequence, goods passing over several Rail Way lines did not cover the entire distance under the same contract or rules.

Some Rail Roads would not assume the responsibilities of the contract which the original transportation company had taken upon itself, including, perhaps, the extent of liability in case of damage to perishable goods.

The Uniform Bill.

As a result, the adjustment of losses for goods in transit frequently became complicated, and sometimes resulted in a tedious and long drawn-out transaction, to the detriment and annoyance of the shipper, tying up considerable amounts of capital.

This unsatisfactory feature was the subject of deep concern to both the Rail Roads and shippers for a number of years.

Finally, with the assistance and approval of the Interstate Commerce Commission, and after agitation by the American Bankers' Association, a uniform bill of lading was adopted and went into effect November 1, 1908.

So important is the bill of lading in our foreign trade that owing to the forgery of the signatures of Rail Way Agents on bills of lading, foreign banks and bankers have declined to accept them, and are demanding that either the bills be guaranteed or that higher Rail Road officials certify to the signatures of the agents who issue bills of lading. This situation was so grave, that for a time it seriously affected international trade, particularly in cotton.

One Billion Dollars Daily.

It is estimated, on the basis of home and foreign business, that from seven hundred million to one billion dollars in Rail Road bills of lading are in banking use in the United States daily.

This comparatively little known convenience, therefore, in addition to the protection and assistance it affords to the producer and to both buyer and seller in commercial transactions, adds approximately 40 per cent to the circulating medium and liquid credit of the country.

ABORIGINAL CUSTOMS, FROM CAPTAIN JOHN SMITH'S BOOK. LAND WAS CONSIDERED VALUABLE ONLY FOR ITS HUNTING AND FISHING.

SECTION XXI.

TRANSPORTATION A DEVELOPER AND CREATOR OF VALUES.

The Origin of Land Values.

Cause—Then, Effect.

The aboriginal American, the red man, was a stranger to civilization when the white man found him, largely he had only the most rudimentary means of intercommunication.

The machinery of and the constant incentive to trade, found in civilized communities and surroundings, were both wanting. The Indian's simple wants were generally amply and easily supplied at first hand by nature and the chase. Judging from present stand-

ards, even the white man at the same period was only in a state of embryonic civilization, so far as his facilities for travel were concerned.

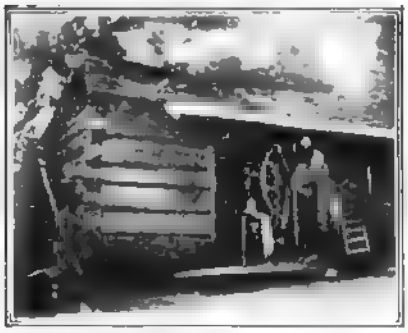
The Sequel to Transportation.

In the Indian Territory and Oklahoma to-day, however, many Indians have farms as well tilled as those of their pale-face neighbors, and where they have allowed themselves to be carried along on the full sweep of the flood tide of progress they have shown themselves to be true Americans, even in the complete sense of the word.

The African, when brought into contact with civilization, showed himself susceptible to its influences; and when reared amidst civilized surroundings, his descendants readily adjust themselves to the environment which is so radically different from that which their ancestors knew for centuries in the Dark Continent.

The Esquimo.

The Esquimo is a near and intimate example of the primitive; he lives a semi-tribal life, wandering over land to which he makes no claim or assertion of ownership, title or dominion. As with the primitive African and Indian, the cause is that the Esquimo has not as yet been brought into direct contact with civilizing influences. He has little desire or incentive to produce anything save what is necessary for immediate personal use.



PRIMITIVE SPINNING

CARRYING PEAT, IRELAND

Our Own Primitives.

In the Great Smokies.

Still closer to us, both by consanguinity and geographically, are the residents of our Appalachian mountain ranges, particularly in Western Virginia and West Virginia, Western North Carolina, East Tennessee and Eastern Kentucky, and Georgia, who, not in touch with the Steam Roads—and by means of them, with the progress which the nation has made in the past four score years—are still backward and primitive to a pitiable degree.

The writer has seen in those districts houses that were built without the use of a single nail, the floors composed of puncheons or slabs of wood, roughly hewn on one side, and laid together with little idea of securing a jointed or level flooring

A Lost Chance.

He could write pages and pages showing how lack of touch with the world renders these descendants of America's first settlers, who should be the leaders of the nation, almost childlike in their simplicity, largely ignorant of the world outside, and lacking in their surroundings all those many comforts which, in the Rail Road spanned sections, have come to be regarded as necessities.

In the kingdom of the new world-intelligence, contact is the essential agent, and transportation the prime minister of progress.

FOUR INDIAN CHIEFS OF THE SIX NATIONS IN COURT DRESS ON A VISIT TO LONDON.

When the world was moving slowly sagas and tradition sufficed to convey intelligence and preserve history; but since the world of events has begun to hum and spin, actual contact with fellow-man is essential, or we become rusty and fall behind in the race for progress and prosperity.

In the Dark Continent.

In many parts of Africa, at the present day, there is no transportation except on the backs or heads of human beings, and, as a result, even though the cost of this transportation is but a tithe of what it would be in America by human carriage, nothing can be marketed except ivory, rubber, spices, gold or other commodities whose value is considerable.

As a result, in these regions, land, however rich, being useless for permanent agricultural development, is without value or individual title.

Products Not Transportable.

We find that probably 85 per cent in weight of our articles of exchange, commerce and trade, are worth less than one cent a pound. What proportion of them would be of commercial importance under the transportation conditions existing in Africa, where a professional porter carries but 60 pounds ten and a half miles a day, may be imagined. Moving them ten miles would consume their value

For instance, in America in many places eight pounds of coal are worth only a cent and two-thirds; corn, our greatest cereal, sells for approximately a cent a pound, and the average for 20 years was two-thirds of a cent; six pounds of iron ore may be bought for a cent, two and one-quarter pounds of hay are worth about one cent at the farm; four to eight pounds of lumber cost

one cent; the farm value of a pound of potatoes is less than a cent and one-quarter; and so we might continue through many commodities. Yet these prices include the cost of freighting.

Land Not Worth the Taking.

Indians Not Land Owners. The reason there was no private ownership of land in the days of the red man's occupation of America was that as a result of the non-existence of more than the simplest wants, easily to be filled, there was no incentive to claim land as private property.

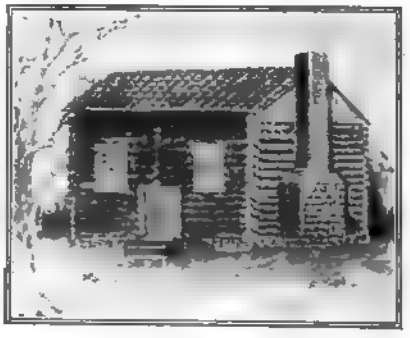
Whatever a man desires assumes value in his eyes, and soon also in the eyes of his neighbor. But, as no one saw any use in possessing any particular piece of land, it did not have any real value beyond its intrinsic worth.

Had It Been Otherwise. Had there been individual ownership, with its consequent inborn instinct protecting that which one owns, the white man would have encountered far greater difficulty in acquiring the large tracts of land which he often confiscated without any opposition or secured by tribal trade or treaty for merely nominal consideration.

$24 for New York City. Manhattan Island, having to-day an assessed valuation of $4,500,000,000, an average of $350,000 an acre, was sold by the Indians to the Dutch for $24. The original purchasers, therefore, secured the land at a rate of six acres for one cent.

PENN PURCHASING PENNSYLVANIA.

THE FIRST CHURCH AND SCHOOL HOUSE WEST OF THE ALLEGHANIES, NEAR JONESBORO, TENN., 1780.



William Penn purchased a large part of Pennsylvania from several tribes of Indians. The name of the state means "Penn's woodlands." He did not drive quite as shrewd a bargain as the Dutch of New York, for he was a just man and scorned to take advantage of the simple redskins. He paid what they demanded, and if they were dissatisfied afterwards, he paid them more.

Liberal Penn. Many of the claims overlapped, but Penn cheerfully bought the same land from several claimants. Still, he probably paid only a few cents a square mile for it, although it is not easy to estimate his actual

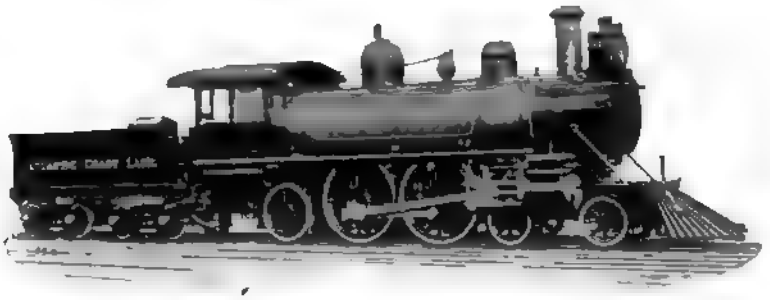
monetary outlay, as the considerations mentioned in the deeds consisted of rum, cider, beer, guns, kettles, clothing, axes, implements, beads, red lead, wampum and other like articles.

Land Without Value.

The absence of private ownership of land did not, however, prevent the Indian from going to war over the use of hunting and fishing grounds; but it was the game and fish rather than the ground or land as such for which he fought.

Intrinsically, land was as valuable when the Indian held full sway as it is now; because of the richness of its untilled virgin soil and the untouched forests and mineral resources, its value was actually more then than it is to-day. But because of the overabundance of land, and the lack of transportation facilities, resulting in the absence of trade and commerce, it was not worth even the effort of nominal assertion of title.

Had it been otherwise, the Indian would be the nabob of our nation to-day.



THE KEY TO DISTRIBUTION.

Transportation the Pivot of the Present.

Tie-Up and Famine.

How different are present conditions, was impressed upon us with striking force by the tie-up of the Central of Georgia Rail Road in June, 1909. So dependent upon the Railed Roads for their daily food supply were the citizens of even small towns and semi-rural districts that within less than a week after the service had been interrupted many places reported they were short of necessities.

Business men in Crawfordsville, Ga., wired: "For God's sake, do something, as we are threatened by famine."

Equalization.

In truth, but for the Rail Roads and the connection they have given us with almost every section of the country, land would be immoderately high in sections near centers of population, while that at a distance, however fertile, would be inordinately cheap. Hence, values in interior sections of the world have been broadened and increased tremendously. This, while holding good in almost every nation, is particularly true of the United States, with its great areas far from navigable water.

ONE OF THE FIRST REAPERS (McCORMICK)

More has been accomplished in the past 90 years, since the advent of improved land transportation, in many directions which affect us most intimately, than in the 8,000 years that preceded.

Over the Alps Lies Italy.

Attention has already been directed to the fact that it took Caesar four days to cross the Alps; 2,000 years afterward Napoleon was able to make the journey in no shorter time, indicating that for 20 centuries land transportation made practically no progress.

Up to 1625 there were only 20 public vehicles in London, which indicates the primitive state of land transportation even at that late day in what was already the commercial and art center of a powerful nation.

What It Has Done.

As agriculture grew, as trade throve, and as transportation increased, man wanted land as his individual property, for in land lay the power to produce and thus to trade and gain comfort and wealth. It was realized that land is one of the great mediums from which riches, and through riches, position, may directly be gained, and as means of communication increased and roads were built it came to have an enormous value.

Transportation gives value to many natural sources of wealth. Writing 21 years ago, a well-known author pointed out that "Rail Ways are only benefited incidentally by these advances through the increase in traffic they produce, while many individuals are enriched and the market values of lands at terminal points and districts traversed are greatly enhanced."

Quickly Created Value.

One of the arguments advanced 70 years ago in favor of state aid for the Rail Roads was that "however unprofitable the ventures might prove they would greatly increase land values, and all the land owners benefited should be obliged indirectly to assume some of the risks of the undertaking."

The cash value of the lands of the entire country have been enhanced by the Steam Roads to a figure which far exceeds the construction cost of the roads, and such gains frequently have occurred along lines that were unprofitable to the investors.

Value Creation.

The Georgia Central, on November 1, 1839, reported that "in every case where a sale of real estate has taken place since the commencement of the work, the price has been much advanced, and in many cases to many times the amount that would have been demanded before the road was projected. In some cases the amount paid to the proprietor of the land for pine timber, for the construction of the road, has exceeded the price that the entire tract would have sold for three years ago."

The president of the South Carolina Rail Road Company, July 10, 1837, reported: "A moderate estimate has been made of the additional value of these lands since the road was located, and it has been found that the advance within a mile of the road and beyond the influence of the towns at either end has been equal to the cost of the original construction of the whole road."

The Experience Duplicated.

For modern example, the writer well knows a section of our own country, scarcely more than three hours' ride from the nation's capital, where 25 years ago land was worth only a trifle an acre.

Later, Rail Road facilities were introduced, and to-day this region is producing thousands of tons of coal, through the use of which factory wheels are made to whir, filling broad and distant sections of the land, even in far-away New England, with the hum of industry, lighting our cities and warming our houses. Huge steam leviathans of the deep, bearing in their holds the products of our country, are forging their way against head winds along our coasts or across the ocean with the aid of the imprisoned power of the fiery genii this fuel releases. This land which has received commercial value from transportation has leaped to the value of a thousand and more dollars an acre

THE RAILWAYS HAVE POURED WEALTH INTO THE LAP OF UNCLE SAM

The iron lands of Minnesota, Michigan, Alabama and Wisconsin, now worth hundreds of millions, have also had a similar advance.

Nature's Treasure Store.

Because of the cheapened cost of carriage, vast coal, iron and other mineral deposits in many sections of the country became accessible and received their present value and development through the ability to ship and market minerals profitably after they were mined.

Value Producers.

It appears that the public carriers of the country, by their extensions, like the irrigating ditches of the West, have made life, growth and wealth possible in otherwise useless wastes.

High Ways vs. Rail Ways.

Transportation has been the basis of land values in many places, and as the Rail Way gives the best transportation, so is the value of the land contiguous to or served by the Railed Way greater than that of land served only by ordinary roads and animal motive power.

The importance of our Iron Roads is thrown into strong relief and shown to us in a more nearly correct light than before, when we estimate the cost and consider the details of attempting to handle the products of the nation by means of the highways, which alone allowed land transportation before the Railed Road era.

The impossibility of doing this is shown by government statistics as set out in "Contrasts for Thoughtful Consideration."

Girdles 'Round the Earth.

The Railed Roads are, however, the modern highways. It was they and their brethren, the "ocean Rail Ways," that made feasible Phineas Fogg's fancied compass of the earth in 80 days, the world-circling ideal of 20 years ago. Later, with their help, man was enabled to reduce the time to 59 days, and to-day they make it possible to girdle the earth in 40 days.

Before the Rail Roads came, two or three years would have been considered express time for a 'round-the-earth journey over the route taken by Jules Verne's hero.

A Resumé.

The colonies and their successor, the nation, struggled for 223 years after the settlement of Jamestown, under the regime of the old road before the wealth reached a valuation of $3,200,000,000. This growth was at the rate of $14,300,000 a year, on the basis that the land had no market value at first. In 74 years of modern methods this valuation, according to the latest casting of Uncle Sam's ledger, increased to $107,000,000,000; this report is six years old and the estimate of the present value is $130,000,000,000.

The average growth during the 74-year period was 98 times as rapid as the former, being at the rate of **one billion, four hundred and five million dollars** a year up to 1904. Figuring up to 1911, the 1830 wealth was added every two years. In other words, the former year's increase is now added twice a week.

Centralisation. The Railed Roads have enabled us to live in both country and suburbs with a far greater degree of comfort than is possible in the crowded city. In other words, the Rail Roads have connected the village with the town, the town with the city, and the city with the greater metropolis; nor have they failed to connect the village directly with the metropolis.

As a consequence, in the United States, the new transportation has welded the bonds of union among neighbors, and served indissolubly to concrete and unify the nation.

An every-day illustration, one within the ken of all, graphically showing the relation of transportation to value, is furnished by the suburban development of any present-day city where those plots of ground which have convenient and rapid transportation, sell for infinitely more than the land not so served.

"Twenty-five Minutes' Ride." The seller, where transportation is convenient, lays particular stress upon the fact that the lot is within so many minutes of the heart of the city, or that it can be reached for a certain minimum fare, ignoring the fact that it may be 20 miles away.

SUBURBAN STATIONS.
THE RAIL ROADS HAVE MADE SUBURBAN TOWNS POSSIBLE.

This accentuates the statement that the Railed Roads have been the great real estate operators who have opened up vast tracts of lands, which have been divided and subdivided into smaller and smaller sections, each time, like subdivisions of acreage into lots, with intensified value, thus constantly making the nation richer and bringing it and its people closer and yet closer together.

In the Same Way. To-day we gauge distance not by miles, but by the hours and minutes necessary to cover it. Our Rail Roads prepare a schedule for us and negotiate the distance in a given time. But via our ordinary roads we must still use the old measure of miles, for it is difficult accurately to foretell the time necessary to traverse them.

A Real Advance. Man is nearer his neighbor, being able to reach him more quickly and easily; he has more time for social intercourse, and can see, learn and accomplish vastly more than the man who lived a century or so ago.

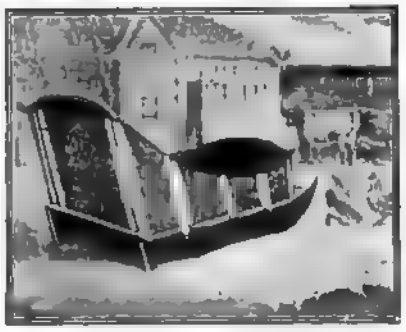
The farmer will emphasize, not how far he is from the Steel Road, but how near to it, and he bases the value of his property largely on the proximity to this transportation facility. But, while the farmer may have been made rich, or at least well-to-do, by his new and better transportation facilities, the man who built it and the investor may have lost, not only interest, but the principal of their investment, in what the owner of land calls "our nearest Rail Road."

Verifying an Adage.

In our day and generation the saying that "a good road is half way home," gathers rather than loses force. In no case does it seem more forcibly applicable than in that of the modern Steam Highway, on which the people of the nation to-day depend for their own transportation and for the moving of their freight, and which has enabled them to partake of the abundance of every convenience and comfort which the ingenuity of man has been so prolific in creating and providing.

OXEN BRINGING UP GUNS IN THE REVOLUTION.

A SLEDGE OF 1768.



SECTION XXII.

CONTRASTS FOR THOUGHTFUL CONSIDERATION.

The following pages contain some instructive facts and figures from various sources relating to some of the many branches or activities of transportation and carriage. Many of the comparisons are almost startling, and show how the industry cannot fail to have an important effect on progress and prosperity.

To bring their importance home, as affecting the wealth and progress of the nation, a comparison with some more or less analogous figure is made in each instance.

A Parallel. We compare, under the heading "Foreign Wages," the Rail Way wages paid in foreign countries and the United States. Now, let us examine a few of the charges by the Steam Roads of the United States for certain services, and the wage distribution in connection therewith, comparing them with those of Europe.

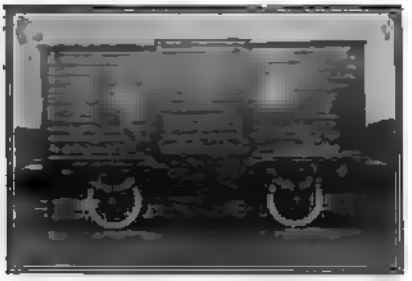
One Difference. A man traveling by rail from Liverpool to London, pays $5 50 for journeying the 200 miles, or more than half as much again as would be required for the same distance in some places in the United States; for example, the fare from Boston to Albany, 201 miles, is only $3.50.

The engineer who pulls the English train is paid $2 for the run, while the engineers running the engine from Boston to Albany receive $7.60, almost four times as much, for substantially the same mileage.

Another Difference.

If the traveler were to make the trip from London to Edinburgh, a distance of 400 miles, he would be charged $13.92 for the trip, the engineers who handle the train receiving $6.

In this country, he could travel on the Empire State Express from New York to Buffalo, a distance greater by 40 miles than that from London to Edinburgh, for $2.67 less, and on an ordinary train for $5.42 less. The engineers who pull the Empire from New York to Buffalo are paid $16.64.



EUROPEAN GOODS WAGONS, 5 AND 10 TONS CAPACITY.

Not Shipper's Heaven.

On the continent of Europe, the trader or the forwarding agent, for economy's sake, must pay for a five or a ten-ton car, or "waggon," as they call it, whether he can fill it or not. Otherwise, the Rail Roads, when they act independently, and the forwarding agents, when they act as middlemen, sometimes hold consignments back for a certain period, if thereby there is a chance of making a full load.

The Bread of Toil.

The Socialistic theory is that wages should be based on the essentiality of all to society. This principle has scarcely been applied to the wages paid to the Rail Road business. There are interesting and grave differences in the services which are performed by, and the returns made to the transportation and the various other lines of business that compose the commercial entity.

The Manufacturer.

The manufacturer, for instance, may only assemble the different parts of certain articles, probably all of which have been brought to him on the Rail Roads. After having been put together, the parts, now assembled, are again placed upon the Railed Road car, and hauled to the point of consumption or final distribution

For every $1,000 invested in his business in 1905, government records show the manufacturer to have received a net return of $151; he was, therefore, conducting his business at a profit of 15 per cent. Our national banks also average 15 per cent. profit on their capital.

The Farmer's Freighting.

The farmer, with his team, moves his produce on the average nine and a half miles, only a fraction of the journey toward its market and ultimate point of consumption.

His returns in 1905 were $98 for each $1,000 of investment in his business, a profit of nearly 10 per cent.

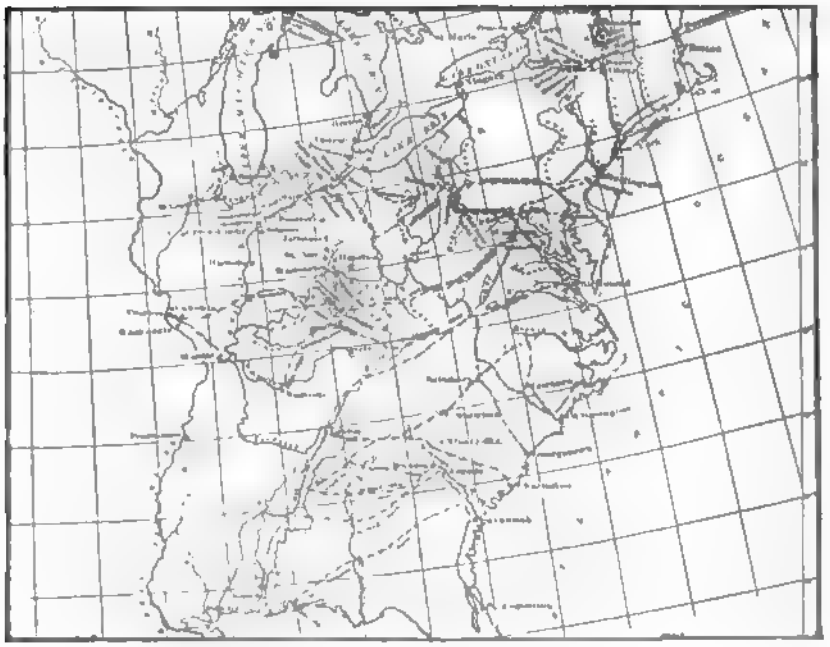
Work Worthy the Name.

The Rail Road merchant, however, moves the majority of the goods of the farmer, the miner, the manufacturer, in short, the producer of every sort, an average of 151 miles at least once, and frequently several times. He renders an additional service of much value by delivering them at the most advantageous and profitable market points.

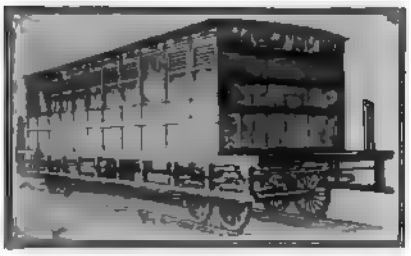
Nevertheless, his return on each $1,000 of investment was only 4.19 per cent. This was less than half the profit of the farmer, and only little more than a fourth that of the manufacturer.

Compensation Infinitesimal.

Though a single modern freight train will carry as much as 1,500 to 2,000 wagons and teams, our Rail Roads, nevertheless, are paid, as may be seen in "The Analysis of a Rail Road," sums which are but a fraction of those received by any business doing only a tithe of such service.



CRUDE TRAILS, PATHS AND WAR PATHS,ALL OF OUR ROADS OF THE COLONIAL PERIOD



BOGIE CAR WITH AXLES, B. & O., 1835.

FIRST SHIPMENT OF GRAIN FROM CHICAGO, 1839.

The Cost Before the Days of the Rail Roads.

The Pack Horse and the Wagon.

Let us for a moment look backward to the days of the pack horse and the wagon. In 1795, Griffin Green, of Marietta, Ohio, paid at the rate of $155 for each long ton conveyed by wagon over the road from Philadelphia to Pittsburgh, about seven cents a pound.

Bills for hauling in those times between different points show that this was not much above the average price.

The shipments of freight by pack-horse in those days from Philadelphia to Erie cost $249 per ton. Before the advent of the Erie canal this had been cut to $110 a ton, and in the early days of the canal, it was further reduced to $20. By rail to-day, it is as low as $2.50, or one cent for what cost $1.00 in pack-horse days.

Twice Three Weeks.

In 1865, 2,000 tons of rails were shipped by water to Nashville, Tenn., from the iron and steel mills at Brady's Bend, Pennsylvania, on the Allegheny river. The trip, which took six weeks, may be completed to-day by passengers on a Rail Road train in less than a single day.

In 1867 the transportation charge on wheat from Chicago to New York, which had been as high as 44 cents a bushel, was reduced to 20 cents. Since then it has been further reduced to eight and three-quarter cents.

The Poor Man's Loaf.

In the period from 1870 to 1880 the freight which the Eastern man had to pay on a barrel of flour from Chicago to New York, was reduced from $1.60 to 86 cents; it is now about 50 cents.

We are told that the dirt is flying at Panama, but not much more actual dirt has been excavated, and that at a larger cost, for account of the 92,000,000 Americans, than for the 60,000 owners of the Pennsylvania Rail Road, in the straightening, improvement, etc., of the tracks between Pittsburgh and Philadelphia, and the putting in of two new low-grade freight lines.

A Bumper.

The corn, wheat, cotton, oat and tobacco crops of the United States, combined, are worth $2,600,000,000, while the total disbursements of the Rail Road industry, including new lines built, represent an annual financial crop of fully $3,000,000,000.

A Calamity. The failure, or serious reduction in the output of almost any of these agricultural products is considered a national disaster; it has an immediate effect on a large part of the community, where the result is felt in the wage of and demand for labor, in the prices of securities, and in the general lessening of prosperity in mercantile, mining, and manufacturing circles.

Greater Calamity. It can be imagined, therefore, how paralyzing must be the result to the country if through excessive or threatening legislation, or for any other reason, there is a failure or lessening of the largest of our crops, that disbursed by our rail transportation merchants, which may take away from the channels of commerce sums larger than would be withdrawn through any ordinary failure in crops of the staples above mentioned.

THE RAILWAY'S PROFIT ON FREIGHTING A STEEL RAIL WOULD BUY SIX INCHES OF RAIL; ON A LARGE STEEL RANGE, A JOINT OF PIPE; ON A REFRIGERATOR, A 9-CENT CAKE OF ICE.

AN ANALYSIS OF STEAM ROAD FREIGHT CHARGES.

Inland transportation rates and profits at close range.

In tracing the course and vehicles of progress and prosperity, we have ascertained that the transportation of our persons and our products is a business; that the owners of the Steam Roads are merchants, and that the enterprise is one of the most important links in the chain of our industries.

Value-Making Transportation. The theory of commerce and trade is that each handling of any one of the products of the nation which places it in a newer, better and wider market, increases its value

This is entirely apart from the additional value through the physical metamorphosis of raw materials, which occurs in each of the several places to which they are transported to be manufactured. Iron, for example, may journey half a dozen times over the road of rails, before in its final shape, say, as a plow or reaper, it is put to work in the service of man.

Judge Not Rashly.

The impression seems to have arisen that because of the vital importance of the service, and because Steam Road transportation does so much as an increaser of values, the business itself must exact excessive profits.

It is certainly of interest and necessary to an understanding of the transportation question to find how much of this is true, by taking examples of such shipments as are commonly made upon the Steam Roads and seeing what proportion the carriage charges add to them.

Farming Implements.

The cost of hauling a harvester, built in Chicago and carried to a farmer, say, 300 miles away, is $1.76. The harvester is worth $130 and, therefore, the Rail Road gets for carrying it and placing it within reach of the farmer, gross one and three-eighth per cent of its value.

The net profit of the Rail Road merchant or stockholder for taking this valuable and necessary machine from the factory to the wheat field, thus adding another labor-saving assistant to those aiding in creating our prosperity, is less than a cent and a half on $10 of its value, for of the gross freight of $1.76 substantially $1.59 is paid out by the Rail Road in wages, interest, upkeep, etc.

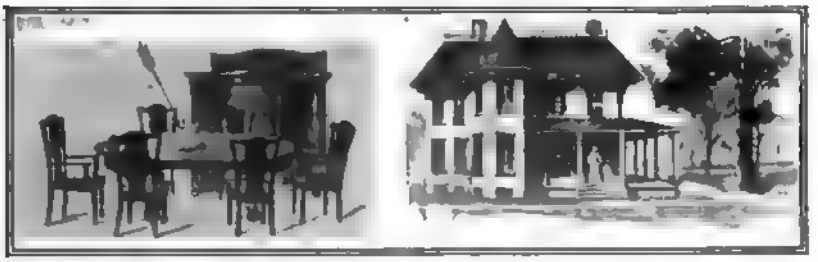
Steel Stove.

The freight from Detroit to points 400 or 500 miles away, in the Mississippi Valley, approximates $2.00 to $2.50 on a steel range which weighs from 400 to 500 pounds, retailing at from $55 to $60.

Several Rail Road merchants divide this gross amount and their combined profit is 25 cents net on the $60 article.

A Cooler.

The freight charge from Michigan to New York on a refrigerator, whose value at retail is probably $30, is approximately 75 cents, two and one-half per cent of the value. After paying out all expenses, the Rail Road merchant's profit on this is one-eighth of that amount, less than one three-hundredth of its value.



THE RAILWAY'S PROFIT ON THE FREIGHT OF A DINING-ROOM SUITE WOULD BUY A 15-CENT CUP AND SAUCER.

ON THE MATERIAL FOR A $5,000 HOUSE IS $15

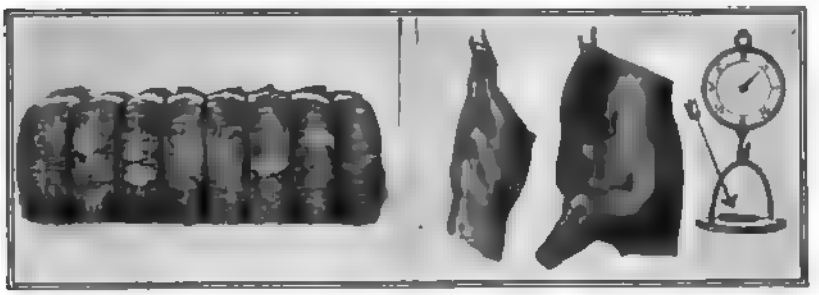
Steam Road Charges as Applied to the Home.

Let us say you live in an eight-room brick house. The builder paid the Rail Road Company not more than $150 for the shipment

of all material used, although the value of such a house probably is $5,000.

In other words, the Rail Road charge for bringing even such heavy and bulky stuff as brick, lumber, stone and other building materials, adds only $3 gross to each hundred of the cost of building the house. The architect who draws the plan, gets five per cent, while the transportation company which draws the material from half a dozen distant points to where it is needed, gets three per cent of the gross value.

Furniture. On a dining room suite, including six chairs, table, sideboard, etc., the whole weighing approximately 750 pounds, and selling for from $50 to $75, the freight charge from Grand Rapids to Chicago is $1.60. The Rail Road, therefore, receives gross, two per cent of the furniture's value. The cost to the Rail Road merchant of transporting this suite is $1.45, so that he receives a profit of only 15 cents on the entire $75 suite for his work of carrying it 200 miles.



THE PROFIT ON FREIGHTING A BALE OF COTTON WOULD NOT PAY FOR THE TIES FOR THE COTTON; ON A SIDE OF BEEF, IT WOULD NOT PAY FOR HALF A POUND OF STEAK

Cotton. The average Rail Road charge on a bale of cotton in Texas approximates 80 cents. The average value is $50. Therefore the gross cost of hauling is about one and three-quarters per cent, of which the Rail Road stockholder's profit is 10 cents, 70 cents of the freight charge having to be paid for wages, etc.

The Rail Road stockholder, therefore, receives $2 on a thousand dollars' worth of cotton. The man on the cotton exchange in New Orleans receives as much for merely finding a buyer among his fellow members who are standing around him. A cotton factor who sells cotton for the planter's account in towns which have no exchanges usually gets one dollar a bale, worth from $50 to $75, for his part in handling the staple.

Beef. Forty-five cents a 100 pounds is charged for transporting dressed beef from Chicago to New York in a heavy refrigerator car weighing nearly as much as the beef itself. Out of this 45 cents, the Rail Road must pay over 40 cents for expenses, labor, etc., getting a return of one cent on twenty pounds.

A SOURCE OF FOOD SUPPLY FOR MILLIONS AT GREAT DISTANCES.

Think of what your butcher charges a pound for service in transferring this beef for the short distance across the counter to you. Does not the charge for transporting it a thousand miles seem at least reasonable by comparison?

Fresh or Canned.

If we want fresh vegetables out of season, the freight on all an entire family consume at a meal would be about two cents. When we eat canned goods, we have only to pay the value of two letter postage stamps for the gross freight on a case of two dozen cans, in car load lots.

The Rail Road merchant's return on his stock investment, for hauling oranges from California to New York is about nine cents per crate weighing sixty pounds, containing perhaps 196 oranges worth at retail, say, $6.50. The nine cents are divided among the stockholders of at least three Rail Road systems and many individual Rail Roads.

The Staff of Life.

Wheat weighs sixty pounds to the bushel; it costs in round figures 10 cents to transport a bushel a thousand miles. After paying out expenses, wages, etc., the Rail Road merchant has a cent and a fifth for bringing it one-third of the distance across the continent.

Freight Rates on Raiment.

Clothes.

A man's suit of clothes will be shipped from New York to Chicago, where it retails at say $20. The cost of transporting it is from three to four cents per suit.

The transportation of 100 suits, having a retail value of probably $2,000, would cost, in round numbers, $3.50. The stockholder's profit on their money investment is just about 40 cents. This return is two one-thousandths of the shipment value, or two-fifths of a cent on each $20 suit of clothes.

Our Own Charges.

According to the tariff schedule, the duty, or Uncle Sam's profit, on an imported woolen suit worth $20 would be $14.64, or 60 per cent ad valorem, plus duty at 44 cents a pound.

This is the toll you exact on these goods through your government for merely passing the wares through the custom gates, 3,600 times more than the transportation company charges.

Milady's Clothing.

Let us assume that it is women's clothes with which we are dealing. If it costs an average of only four cents to deliver an entire outfit, including shoes, hat and everything necessary, whether the costume be of silk, wool or cotton, it would certainly seem a reasonable charge.

Yet that is all the Steam Road company receives gross for its service in bringing milady her apparel.

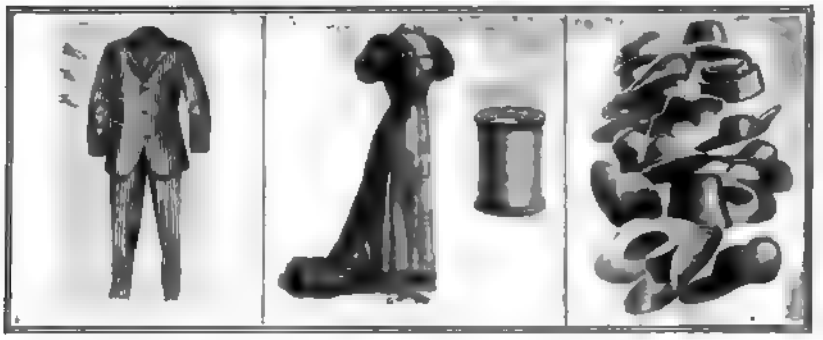
If they happen to be summer or other light fabrics, the cost perhaps would not exceed two cents, and on some of her garments not more than half the cost of a postal card.

Light, But Costly.

Certainly the raiment of Salome, which, though infinitely lighter, necessitated probably the guidance of a whole caravan in its transportation from the farther East, was shipped at a cost very much greater than that of the apparel of her modern disciples and critics.

Five Cents Covers All.

A lady's hat is generally supposed to be the biggest burden on her purse, as well as on her head. Yet the Iron Roads only get one cent for delivering a batch of 16.



THE FREIGHT ON A MAN'S SUIT WOULD BUY ONLY THREE BUTTONS, ON A LADY'S SUIT, WOULD BUY A SPOOL OF THREAD ON 16 HATS, IS ONE CENT

It is a fair assumption that almost any completely attired man or woman at a reasonable distance from a jobbing, wholesale or manufacturing center has not paid more than a five cent hire to the steam truckman for bringing everything he or she wears, out of which approximately 4½ cents have had to be paid out in expenses.

Overcharging at Close Range.

Our Rail Roads haul coal in a battleship car in which it is carried an average of 300 miles, after which the empty car has to be hauled back to the starting point, all for a total of about $1.00 per ton, one-half mill a pound, or, including the weight of car, one ton is hauled approximately 600 miles for $1.

To sum up, the gross value of the products, rough and finished, of the farms, mines and factories of the United States, is $37,000,000,000 annually. The gross cost of the Rail Road transportation of

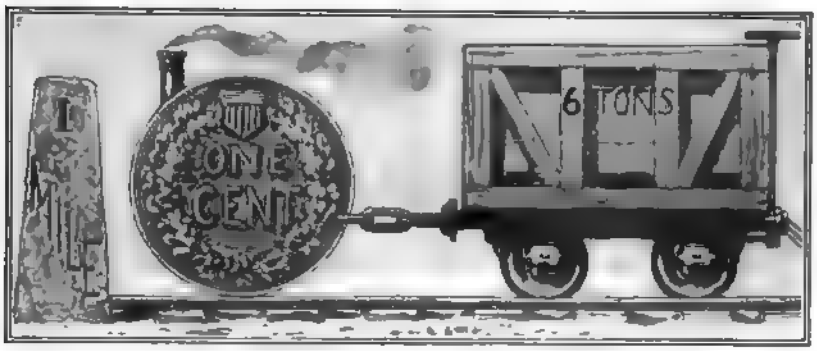
these products is $1,680,000,000, only four and a half per cent of their value for hauling these products an average of 151 miles.

Rail Road merchants got $236,000,000 profit from their receipts of 1909; on freight alone, their profits would probably amount to a half of one per cent.

A Unique Institution.

Such charges as these are hardly duplicated by any other kind of haulage or cartage. No other mercantile enterprise renders service that bears any comparison with this, at the same proportion of the value of goods handled.

The lawyer would not render you advice involving goods for the proportion of their value charged by the Steam Roads for the actual moving of them from one place to another, an average of 150 miles apart. Such charges as the above appear to be hardly perceptible burdens on the progress and prosperity of the nation.



THE RAILROADS HAUL SIX TONS OF COAL AND EQUIPMENT, INCLUDING THE RETURNED CAR, ONE MILE FOR 1 CENT

WHERE FREIGHT REDUCTIONS ARE ABSORBED. THE BENEFIT NOT THE CONSUMER'S.

The Beneficiary.

Many consumers have felt themselves personally interested in the question of lower Rail Road rates, in the belief that they would benefit from these reductions; let us look frankly into the question and endeavor to ascertain what results would be likely to eventuate, and for whose benefit.

Former Rail Road commissioner, later Governor Joseph M. Brown of Georgia, several years Chairman of the Georgia Rail Road commission, through whose efforts large reductions in Rail Road rates were obtained, investigated the result after the reduced tariffs were in operation.

The Final Word.

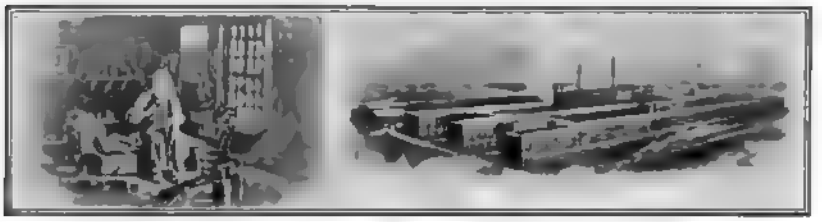
He contends in an extensive and very forceful paper, and proves by impressive figures, that reductions of freight rates are usually entirely absorbed by the jobbers, manufacturers and dealers. He has ascertained that the consumer derives no benefit whatever,

although he believes that the citizen may effect a saving on reduced passenger rates.

In 1905, there was a reduction in the freight charges on men's clothing, dry goods, etc., from New York to Atlanta, of nine cents per hundred pounds, or $27.50 per car load of 50,000 pounds. "Yet," says Governor Brown, "not one Georgia farmer was able to buy a hat, a suit of clothes, muslins or any similar article one cent cheaper, because of the reduction."

Rises Despite Reductions.

Although freight rates on cloth were reduced almost eight per cent, the price of that commodity went up about seven per cent in two years. And, in spite of the fact that the freight rate on boots and shoes was reduced $67 per car load of 30,000 pounds, the price of shoes went up 40 per cent.



THE OLD-TIME COBBLER AND THE MODERN SHOE FACTORY

Brogans Up, Rates Down.

In 1905, the wholesale price of men's brogans was 92½ cents per pair. In May of that year they were advanced to 95 cents per pair, later to $1.25, and in December, 1906, to $1.30; the increase in price for car-load lots of 30,000 pounds was, therefore, $3,375—40 per cent.

During the same period, there was an $87 reduction in freight rates.

Nary a Red.

The total reduction in Rail Way freight rates on shipments for the state, according to Governor Brown, was $2,000,000, but the consumers were not allowed to share one cent of it, for without exception, no reductions in retail prices were made.

The Saving if Rail Road Rates Were Reduced.

Now, let us see what the reduction of 10 per cent of the present freight rates would save for the consumer, if the retail and other dealers would grant him the benefit of the reduction.

A 10 per cent reduction, it is necessary to note, is practically sufficient to take away all profit earned by the Rail Road merchant.

Years for a Penny.

A 10 per cent reduction from the freight rate on shoes would amount substantially to one cent on 10 pairs. Estimate how many pairs of shoes the average man wears per year, and then figure out how many years it would be before he could get any substantial benefit

from this reduction. If he uses a $3 shoe, he would have to wear out 3,000 pairs before saving the price of one pair.

If we were to decrease the Rail Road charge on some classes of cotton goods 10 per cent, it would make a difference of no more than one thirteen-hundredth of a cent on a yard of goods. Therefore, to save one cent, we would have to buy 1,300 yards of cotton goods, assuming that the retailer would give us the benefit of the reduction.

A Great Bargain.

Considering the average use of these wares, it would probably take a life-time, unless, as is the custom in these bargain hunting days, the consumer purchased the entire 1,300 yards at one time for the sake of saving one cent. In that case he would have to reckon the cost of storage, handling and interest against this saving.

Practicing and Preaching.

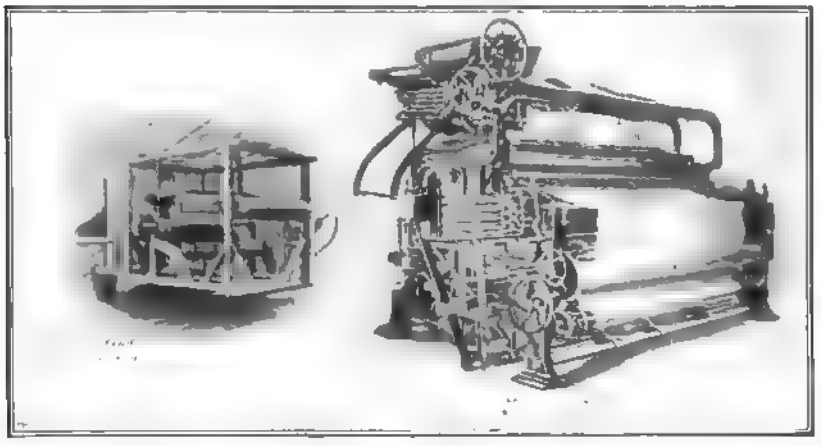
The New York Central lines purchase about 4,500,000 pounds of paper each year, for which they pay approximately $250,000, which is $48,000 more than the same quantity would have cost at the prices paid a few years ago.

An increase of 10 per cent in the freight rate on this amount of paper from Boston to Buffalo, a distance of about 500 miles, would amount to $367.50.

His Ox Gored.

Yet the paper manufacturers strenuously object to a reduction of $367.50 from the $48,000 that they now get every year above their previous receipts for the same wares. The additional freight rate would be only a one hundred and twentieth part of the increased paper cost.

The panic of 1907-8 has by some been traced to the lessened income and consequently reduced spending capacity of the Steam Roads. The effects of this panic inflicted severe financial injury on many industries and every class of people, from the wage earner to the capitalist.



ERAS IN WEAVING

N. Y. C. MULTIPLE UNIT ELECTRICALLY OPERATED TRAIN, WITH MOTORS ON EACH CAR.

What Have You Gained?

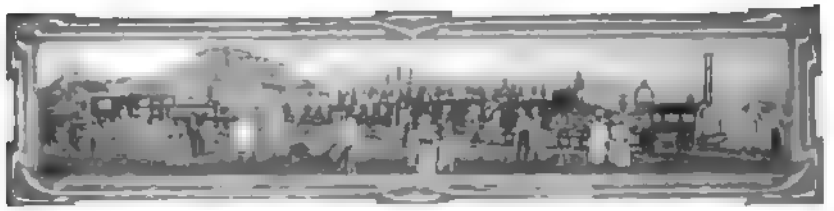
Since the manufacturer, producer and shipper seem to have been seriously hurt by the panic, were they themselves bettered by trying to force their fellow merchants, operating the Railed Road, to do business for them on too small a margin?

It is safe to say that the manufacturer and the jobber, by selling their wares in large quantities, as they do in times of general prosperity, would profit quite as much by the increased volume of business, as by gaining the much coveted small part of one per cent on the value of the goods, which each would get from the 10 per cent reduction of freight rates. It is doubtful whether they would be affected, even by increases amounting to that percentage.

Live and Let Live.

There appears to be little or no benefit to the consumer from reductions in freight rates; since the manufacturer, the jobber, and certainly the Rail Road business all suffer; in view of the fact that the wage-worker is thrown out of work, and every joint in the commercial body of the nation is dislocated it would seem well to test the effect of a fixed "live and let live" policy on our common carriers and the nation at large.

Let the consumer, who, after all, represents the body of the people, figure out for himself whether these infinitely small changes in freight rates would benefit him; whether the $2.50 pair of shoes would not remain a $2.50 pair of shoes, a 25-cent tooth brush remain a 25-cent tooth brush, and a five-cent yard of cloth remain a five-cent yard of cloth, whether the rates were reduced or increased the trifling amount that 10 per cent represents.



ENGLISH MIXED TRAIN IN THE THIRTIES

IN A FREIGHT DEPOT.

SECTION XXIII.

THE GREAT STEAM LIVERY STABLE AND PUBLIC TRUCKMAN. THE IRON BEAST OF BURDEN.

Should we fail to keep our own horses, carriages and trucks, yet wanted to travel or transport our goods for any considerable distance, we would have to use the conveyance of a liveryman or wagon of a trucking establishment. Or, if neither of these were available, or we ignored them, we would have to revert to horses, mules, or some rudimentary form of carriage, perhaps that of our own legs for the movement of ourselves, and for freight transportation to the agency of our own backs.

Homely Way the Only Way.

The comparison which is of the most force and value is the homely one; the illustration which appeals to us, is the one which we grasp most readily and fully. By the everyday comparison, we are enabled to bring home and make clear many obstruse phases of progress and prosperity. Especially is this true in connection with our great modern land transportation agent. Hence the aptness of the comparison between it and the livery stable.

The Rail Road Livery Man.

There is a livery man in your community who builds and maintains at his own expense the roads on which his horses and vehicles travel, pays as much in taxes as is spent on the upkeep of all the common roads, none of which he uses; who supplies you with livery

service and does a general trucking and hauling business which brings you many of the necessities and luxuries of life, at less than a tenth of what it would cost you if you kept your own teams and trucks.

This man's rigs not only are always ready for special calls, but he sends them past your home or nearby at frequent and regular intervals, without any guarantee that they will be made use of and with a general, although in no way compulsory invitation to you to ride.

A MANHATTAN STAGE OF THE THIRTIES

The Ever-Ready.

He furnishes even rural communities with tram service as cheap and almost as frequent as city street car or interurban service, although decidedly more speedy, and in proportion to the population, much better than these, bringing you ten times nearer to your market and to your neighbor in point of time and cost, all at no fixed cost to you. All this the steam truck and livery man does.

If there were a liveryman who would do all this he would appear a desirable adjunct to the community, and be entitled to consideration and encouragement.

Many Stables.

The ordinary liveryman keeps only one stable, and the service he renders is of a very narrow character and covers only a very limited area. The steam livery man must keep many stables or terminals, stations and storage yards, giving you a place of shelter where you may wait in comfort until the arrival of the steam horse and carriage, and where your goods may be protected until they are to be forwarded or delivered. He must keep up the horses, buggies, wagons, and drays of his trade, the locomotives and freight and passenger cars. He also allows his wagons to be loaded and sent to far distant sections of the country without unloading them even when they leave his tracks and go on those of another road.

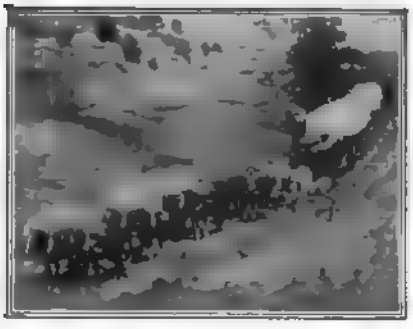
We cannot average more than six miles an hour over good highways in a horse-drawn vehicle; the steam livery man enables us to travel from five to ten times as rapidly, or thirty to sixty miles an hour. The benefits to the community of this rapid travel, free of investment by or assessment on the individual, are great.

Your Own Road.

Comparatively few persons can afford to keep horses, automobiles and other private conveyances. But no one, however rich, could afford to keep a Rail Road of any considerable length for his own exclusive use.

If anybody were to own a Rail Road there are many chances to one that he would often want to go to some point not reached by his own line. In that case, even though he had the means, it would probably take a long time to build a branch or new line to that particular point. So, no matter how great his resources, in this respect the rich man is practically on a footing with the man of small means.

TRAIN EMERGING FROM SNOW SHED IN THE MOUNTAINS.



FREIGHTERS ON THE TRAIL.

Roads vs. Railed Roads.

Intimate Relationship.

Even casual consideration of the relations between the individual and the Iron Road, between ourselves and our steam livery man, should convince us that these relations are very intimate, and that to a great extent the people and the Rail Roads depend each upon the other.

Statistics.

In 1907 the Bureau of Statistics of the United States Department of Agriculture sent letters to thousands of its correspondents throughout the United States, to ascertain the cost of hauling crops from farms to shipping points.

The list of commodities included the 22 principal farm products, apples, barley, beans, buckwheat, corn, cotton, cottonseed, flaxseed, fruit, hay, hemp, hogs, hops, oats, peanuts, potatoes, rice, rye, timothy seed, tobacco, vegetables and wheat.

Difficulties of the Farmer.

Long Hauls. In many sections the hauls are so long that it would take weeks for a farmer with one team to load a car with the produce of his farm. In such sections, however, the farmers frequently co-operate, a number of them hauling in a few days enough of one man's products to load a car. The same service then is performed for another farmer, then for another, and so on until all the members of the group have marketed their crops.

In other places it is customary to have the produce accumulate in warehouses or elevators for a number of farmers and it is then shipped to market in bulk. In some sections, as in the Mississippi Valley, the Rocky Mountains and on the Pacific coast, professional freighters are frequently employed.

Hauling Wheat. The average cost of hauling wheat to shipping points is $1.80 a ton for the average distance of 9.4 miles. To put it more clearly and make a comparison, the actual cost to the farmer to haul a single bushel of wheat 9.4 miles over a country road from his farm to his station is 1.6 cents more than to ship it from New York to Liverpool, 3,100 miles.

Farmers in Nebraska reported having to haul their wheat an average of 30 miles, and the rate charged by professional freighters, the common carrier of the ordinary road or highway, was 12½ cents a bushel. The same amount of money would have paid the Rail Road freight charges on the wheat from Chicago to New York, 1,000 miles, and left something to spare.

Barley is found to have cost from 4 to 19 cents a hundred pounds to haul to the Rail Road station.

Cotton. The average cost of hauling cotton to shipping points was about 70 cents a bale, or 15 cents per hundred pounds. Freight of such high value may be transported profitably in smaller loads, and for longer distances than less valuable articles, like grain and hay.

The cost of hauling hay was high in proportion to its value. The value of the average load of hay in the United States is esti-

HAULING COTTON ON A BAD ROAD. HAULING COTTON ON AN IMPROVED ROAD.

HAULING HAY TO MARKET OVER AN OLD WOODEN BRIDGE.

mated at $11.87. The cost of delivering to the station was $2.32, almost one-fifth the value of the hay.

The average cost of hauling potatoes was nine cents a hundred pounds. It was found that some of the longest hauls, 70 miles over Colorado roads, cost 84 cents per bushel. The production of potatoes under such circumstances, would not be profitable unless they were sold at some isolated market, off rather than on a Rail Road, where the price is abnormally high.

Impoverishing the Crackers.

Corn, rye, and vegetables carried 60 miles over the Georgia mountains to Gainesville, cost about $1 a bushel, or $1.65 a hundred pounds for freightage. These naturally represent only a small percentage of the supply of Georgia's general products, extensive production in the section where delivery costs are so high being out of the question.

The Total Cost of Road Hauls.

Millions for Nine Miles.

The Department of Agriculture reported that the cost of hauling wheat was $33,500,000, including the wheat hauled to local mills for grinding, and the cost of transporting the other agricultural products, after deducting that part of them consumed at home or used for seed, was $94,600,000. It should not be forgotten that the products of the farm constitute only an eighth or a tenth of the total shipments passing over our Rail Roads.

These figures are only for common road haulage. Manifestly this is a small proportion only of the total traffic over our roads. The list omits poultry, and many other articles of road traffic. Getting away from the farmer, attention must be directed to the lumber and mineral industries, the factories and an infinite number of other commercial ventures which regularly use the roads for at least a part of their shipments.

A Fairer Estimate.

The basis upon which Logan Waller Page figures would seem to give nearer the correct total cost of road hauling in this country. Mr. Page, in "World's Work" for July, 1909, takes the 1906 report of the Interstate Commerce Commission as a starting point.

That report shows that the Rail Roads handled 820,000,000 tons of freight originating on their lines.

Assuming with Mr. Page that only one-fourth of that, say 200,000,000 tons, was hauled over country roads at the average cost of 23 cents a ton a mile, for the average haul of 9.4 miles, the total cost of hauling would nevertheless be $432,400,000.

Further Addition.

To this must be added the cost of hauling tonnage from farms and other points of origin direct to wharves, canals and docks. Nor does this estimate include products hauled back and forth between farms and mills.

In France, England and Germany the cost of hauling over common roads is about 10 cents per ton a mile.

It is estimated that $40,000,000 per annum could be saved by a less wasteful management of roads. That sum alone would pay the interest on a billion dollars at four per cent, an amount which, applied to the improvement of roads, would probably be sufficient to secure the saving above quoted.

The Average Haul.

The department's investigation brought out that the hauls of the 22 farm products to market average almost nine and a half miles.

The average time consumed for the round trip of 19 miles, including time of unloading, was eight-tenths of a day; but anyone familiar with the subject knows that a farmer who has driven his horses 19 miles would not again use them the same day. Hence a full day may be considered necessary.

The average load weighed about 2,500 pounds, the speed averaged two and a quarter miles an hour, and the cost of transportation was $2.50.

The Farmer's Express.

As the capacity of the average freight car is 28 such wagon loads, it would take a farmer practically 28 days to load a single car to its full weight-carrying capacity.

If the farmer did not have the Rail Road to haul his grain, the average shipment of 151 miles over the Railed Road would take him seven days for each of the 28 wagon loads. But it should be remembered that when he journeys he must rest his team and himself at the end of each day, pay for stabling and feeding his horses, as well as for lodging and meals for himself, during the 14 days

A STAGE IN SWITZERLAND

the round trip would require. This is on the basis of traffic moving constantly in one direction, although the farmer's wagon might be used for a return traffic of such wares as do move westward, but this would exclude the shipment of produce.

The National Economizer.

Therefore it would require one and one-sixth years, or 14 months, for the delivery of a quantity equal to a carload. This includes working on Sundays, and allows only $2.50 a day for time of team and man, and does not include lodging, stabling and the difference between the price of food purchased on the way and that used at home.

RED RIVER CARTS. ST. PAUL TO FORT GARRY, HUDSON BAY, 1850.

Thus the delivery of this car load would mean a cost for freightage or a reduction in the revenue of approximately $1,000. Including the cost of stabling, lodging and meals for man and beast at a rate of $1.50 per day, the cost would amount to $1,600. Wear and tear on team and vehicle would still further increase the cost.

Immense Savings.

The Steam Roads charge approximately $60 for the same service. In round numbers, the farmer saves 96 cents out of each dollar, or approximately $24 out of every $25, which he would be compelled to spend if the Railed Roads were not available to do his hauling, and it were left to him and his teams.

It should be understood, however, that a speed of 20 miles a day, such as we figure as the average on the all-common road shipment, can scarcely be made over the greater part of our roads the year round, particularly in winter.

In the New York-Paris automobile race several of the contestants reported that they had to pay a dollar a cubic yard to have their cars dug out of the snow in our own West.

Continually on the Job.

If the farmer were his own freighter for the entire length of shipment, he would constantly be employed in hauling to or returning from market. And it would be difficult to find time to plant another crop during that year unless he hired men for the purpose and kept a duplicate team. This is no over-drawn picture.

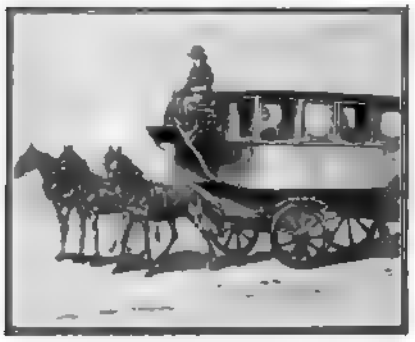
Such a contingency was presented to the early Ohio farmer who was compelled to float his crop to New Orleans, to market it there. He could not get back to his farm until the following autumn, and lost one crop. It also happened frequently that he had not even a return from his first crop because, being unaccustomed to marketing ways, he "fell among thieves" or other sharpers.

Proof.

Considering these unprejudiced, unbiased statistics and cold facts from a government department and an eminent private authority—neither with a point to gain nor axe to grind—we realize what essential factors the iron steed and the road with rails have made themselves in our modern life. Especially does this hold true so far as concerns agriculture, which has been called the backbone of our national life.

The wealth production of our farms in 1909 was $8,760,000,000, or $24,000,000 every day in the year, about $3,000,000 each business hour. The largest crop, corn, was valued at $1,720,000,000. The total value of the farm property five years ago was approximately $25,000,000,000. There were then a little over 6,000,000 farms. The phrase, "backbone of our national life," therefore seems well merited.

HAULING THROUGH THE TUNNEL, CHICAGO



THE FIRST OMNIBUS, LONDON

The Cost of Hauling Over City Streets.

Dollar Fifty Per Ton.

In New York City, the average cost of delivering goods by truck from the dock or Rail Road station to the warehouse or wholesale establishment approximates $1.50 per ton. Yet they sometimes are only a few blocks and seldom more than a mile apart.

Reshipment of these goods to the Rail Road station is often necessary, costing another $1.50.

Food Supplies.

The average cost of delivering large quantities of wares from the wholesale grocers to the retailers of New York City, for all the various classes of groceries handled by team is $2 per ton.

For hauling a van of furniture a distance of four miles in New York City truckmen demand $8. From the upper part of New York City to Bath Beach, another section of the city, the charge is $14.

TEAMS AT ST. JOHN'S PARK, A RAILWAY FREIGHT HOUSE, NEW YORK.

By Rail Road the same goods could be shipped from New York to Buffalo for $8, and for approximately $14 to Chicago.

Ton Mile $56. During the preparation of this article the writer had a filing case and a few boxes of papers, weighing in all not more than 250 pounds, sent a distance of four blocks. For this he was charged $1.75, which was at the rate of $56 a ton a mile.

A messenger boy charges 25 cents for carrying a letter weighing an ounce a distance of less than two miles. This is at the rate of $4,000 a ton a mile.

Team Charges. In Kansas City, a two-horse team with driver, costs $4 a day for from eight to ten hours' work. In St. Louis the charge for the same service is $4.50 and at Chicago from $5.50 to $6 for eight hours' work.

Roads and Rail Roads. Not long ago the writer shipped some treated wooden blocks by rail from Norfolk, Va., to Chicago The charge for carrying these about 1,000 miles, including transportation across a mountain range, was $3.20 a ton

Upon trying to get an estimate for hauling the same material from the Battery to Harlem in New York City, about nine miles, it was found that no truckman would haul it that distance for the same price.

A small sewing machine was shipped from Nashville, Tenn., to New York by Rail Road, and was held at the company's terminal in New Jersey, across the river from New York City. To have the sewing machine taken from there and delivered in the Borough of the Bronx of New York cost $1.00, while the freight charge from Tennessee had been only eighty cents.

Cost of Equipping a Mile of Highway.

To haul one mile by wagon and team the 1,751 tons daily hauled over each mile of Rail Road would require approximately 140 wagons, 140 drivers and 280 horses.

Moving Parts. It is safe to say that each wagon and team of horses would represent an average investment of not less than $350, an aggregate of $49,000.

The investment in sheds for housing 140 teams would be not less than $10,500.

As most existing roads could not stand traffic as heavy as that borne by the average mile of Rail Road, the construction of turn-

pikes, or improved roads, would become necessary at a cost of from $5,000 to $10,000 a mile.

Upkeep. The cost for upkeep of this road, its deterioration, and the heavy expense of maintenance and deterioration of the equipment, estimated at only 10 per cent, would amount to $6,000. Multiply these various items by 342,000, the total Rail Road mileage of the United States, and you will get some idea of how large a capital would be necessary to replace our steam transportation service.

Therefore, to equip an ordinary road with driving and hauling capacity equal to that of a mile of Rail Road would call for a capital of approximately $70,000, the interest on which at 6 per cent would be $4,200.

The actual cost of hauling freight by teams, including interest and maintenance expenses, $1.50 per day for each driver and a fair amount for feeding each horse, would be 21 cents per ton mile, or $377 a day for the freight now passing on each mile of Rail Road. As long as 70 years ago the cost of hauling on the old Cumberland pike was only 17 cents per mile.

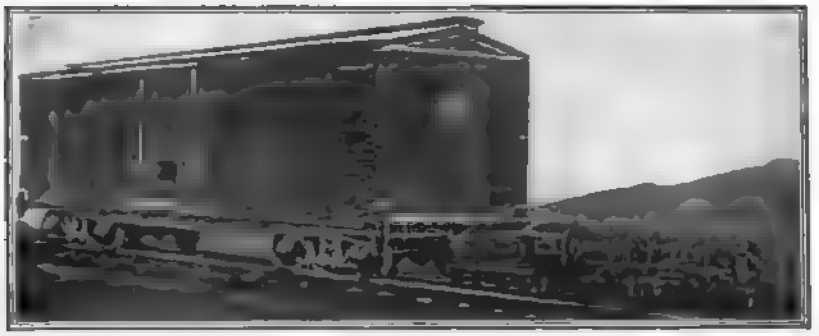
Per Contra. Rail Road rates were seven and one-third cents per ton per mile in 1837. To-day they are only four-thousandths of a mill over three-quarters of one cent, or about one-tenth the original sum and amount to one-twenty-second the cost of turnpike hauling in 1837, on what was the best road of that day.

These comparisons seem to show Steam Road rates have been going down while highway haulage rates have been climbing up.

Capacity in 1836 and 1909. As early as 1836 it was figured on the Baltimore & Ohio Rail Road, when the locomotive weighed about six tons, that an engine would do the work of 42 horses and 12 men.

A modern locomotive on level track can haul 70 cars 400 miles in a day. Each of these cars will hold a load that it would take 28 teams a whole day to haul a distance of 20 miles.

The locomotive, on this basis, seems about equivalent in tractive power to practically 80,000 horses requiring 40,000 men as drivers, tremendous as these figures may appear.



COMPARATIVE SIZE OF A FREIGHT CAR THAT CAN BE HAULED BY A MODERN LOCOMOTIVE.

Passengers by Road.

The Rail Road's Job.

The average number of passengers carried per mile of Rail Road is 233 daily. The average passenger Rail Road journey is 33 miles, the cost of which service is about 64 cents.

Suppose passengers were to travel by horseback. A man upon a good horse with good roads, and if the weather be not too severe, can average 33 miles in a day. But the expenses between this mode of riding and that offered by the Steam Road are quite different.

Heavy Charges.

The man on horseback would have to pay at least a dollar a day for three meals, and another dollar for the care of his nag overnight and its food during the day. In addition the cost of hiring the horse would be from $1 to $3. In New York City the charge for hiring a horse from riding schools and livery establishments is $2 for the first hour and $1 to $1.50 for each hour thereafter. Even if the traveler be but a common laborer it would be necessary to charge at least $1.50 a day for his time.

Roads through Cumberland Gap

Ten to One.

The costs of the day's travel to the man on horseback, therefore, exceed $5 for the same distance for which the Rail Road charges an average of 64 cents.

If the 233 passengers the Rail Roads carry each mile had to go by horseback, the cost to them would be about $35, instead of the $4.45 they now pay collectively for each mile.

By Wagon.

Were the passengers to travel by means of a spring or democrat wagon, seating five persons and a driver, the hire of the wagon and team would be $4 at least. And for the 233 passengers 47 carriages would be necessary.

The meals of the travelers would hardly cost them less than $1 per day for each person and their time certainly would be worth $7.50 for the five. This makes a total cost per carriage of $16.50, or $3.30 for each passenger. The fare would thus figure up to 10 cents per mile.

The Supremacy of the Locomotive.

By Comparison. How does the power exerted by the iron horse compare with the exertion put forth by other hauling mediums? And in what light does the capacity of the freight and passenger car stand when placed in juxtaposition with that of the cart and the carriage?

The average Rail Road car is capable of a load of 35 tons, and a single powerful locomotive hauls 60 or 70 of them 20 to 30 miles an hour, although running time, including the taking of sidings, is only 15 miles an hour. The engine therefore can haul, exclusive of the cars, a load of 2,450 tons, and including equipment, 3,400 tons. This, however, is by no means the limit of the locomotive's capacity under favorable conditions. A single locomotive on the Virginian Railway not long ago hauled 120 cars of coal of a total weight of 9,120 tons. The average train-load, however, is only 302 tons.

A PACK TRAIN OF BURROS.

The Sturdy Infantryman. Probably the sturdiest set of men is to be found in the army. The complete equipment of the infantryman weighs only 36 pounds, with which he travels an average of some two miles per hour.

Sturdy burros of Mexico can apparently carry a load of only 150 pounds, at a speed of perhaps a mile and a half an hour.

Mules are used to transport mining machinery from the Rail Way station to points in the interior in the United States and elsewhere, where there are only trails. The usual limit of weight for these packages is 300 pounds. Only in a few extraordinary cases is this increased to 460 pounds.

The load in even an army packtrain averages but 316 pounds. A strong cart is able to hold from 800 pounds to half a ton. The average farmer's wagon hauls a load of only a ton and a quarter. Thus the maximum hauling capacity of the Rail Road train is from five thousand to three hundred and fifty thousand times as much as the various mediums we have mentioned.

Facts and Figures. A Steam Road passenger car accommodates sometimes as many as 83 people. A single iron horse may pull 10 such cars. Man carries only himself. The flesh and blood horse is seldom expected to

carry more than one person; when hitched to a buggy he pulls two people at an average of six miles an hour, but at that gait he does not last very long. A wagon accommodates four people, but usually necessitates the service of two horses. Few automobiles carry more than seven people. The Steam Road train may therefore haul from 120 to 800 times as many people as the other modes of movement.

The facts and figures given above are useful in determining how much greater is the capacity of the Steam Roads than that of any other mode of land movement and carriage. Nor should the much greater rapidity with which movement is effected be forgotten. To their strength, speed and capacity is it due that modern land transportation is done so cheaply and quickly, resulting in marked additions to our progress and prosperity.

Summary of the Cost of Travel.

Rail Road travel in this country averages 10 trips a year of 33 miles each per inhabitant. If a person took his trips on horseback, instead of on the Rail Road, the total cost on the basis estimated would be $60 a year. For the passenger travel of the 92,000,000 people of the nation at the time of the last complete Interstate Commerce Commission report the annual bill would be $5,400,000,000, which is half a billion more than twice as much as we pay for all passenger and freight service by Rail Roads, and nearly one-half the net capitalization of the Rail Road systems of the country.

The Newer Freight Bill.

We have shown elsewhere that for each individual in the United States the Rail Roads transport an average of 16 tons of freight a year, hauled an average of 151 miles each. At Uncle Sam's own figures of more than 21 cents a ton per mile, the cost of getting the freight delivered by wagon and teams would be $507.36 per capita. The Railed Roads charge only $18.21.

For the whole freight traffic of the United States the cost of delivery by wagons and teams would be the almost incomprehensible sum of $45,652,400,000, 15 times as much money as there is in the country.

This amount is 27 times the freight revenue of all the Rail Roads of the United States, or about three and a half times their net capitalization.

The Advance Agent.

It seems that the steam steed and the big wagon of the Railed Road carry the freight and passengers of the country far more economically than they can be carried by the mediums of land transportation which we had before they came, and to which we would have to revert were we without these improved facilities. It appears that they have to do in no unimportant way with the progress and prosperity of the nation.

MARKETING WHEAT, MINN.

SECTION XXIV.

BAD ROADS, GOOD ROADS, AND RAILED ROADS.

Their Effect on Progress and Prosperity.

How many miles there are of common roads and how their length compares with that of the Railed Roads is a subject of interest, bearing upon the question of commerce and transportation.

New York to Egypt.

Recent government records show us that the great state of Nebraska has a total of 79,462 miles of roads, of which only 23 miles—one in 3,500—are improved. The state, at the same time, has 6,000 miles of Rail Roads, equal to the distance from New York to Alexandria, Egypt, by way of London.

A Small Proportion.

The state of Louisiana has a little less than 25,000 miles of roads, only 35, or one in 750, of which are improved. Iowa has 102,448 miles of roads, almost enough to circle the earth six times in the latitude of New York; only 1,664, or one in 600, are improved. Practically nowhere in Iowa, however, is there a farm or dwelling which is more than 10 miles from a Railed Road.

Montana has only 65 miles of improved roads, or one in 350, of the total of 22,419.

In the Land of Cactus.

In New Mexico there are 15,326 miles of roads, of which only two miles have been improved, or one for a distance equal to that between San Francisco and Rio Janeiro

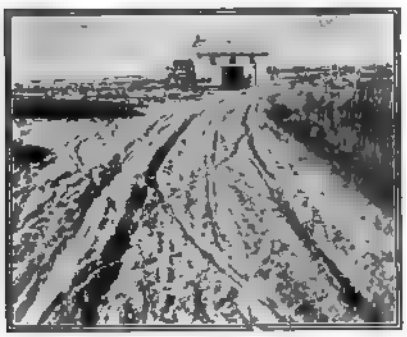
South Dakota has 60,000 miles of roads, of which 151, or one in 400, are improved.

West Virginia, out of 26,178 miles, has 254 miles of roads improved, or one in 103 miles. Most of these roads were national turnpikes, built in ante-bellum days.

Oklahoma, of a total of 43,554 miles, almost two and one-half times the distance around the earth at Philadelphia's latitude, has not a single mile of improved road. She has, however, 2,900 miles of Rail Road, enough to connect Oklahoma's capital with the City of Mexico. The state has neither coast nor navigable rivers.

Neglect or Sloth.

These figures show how sadly the people in many of our great states have neglected their own highways of carriage, how little they have done to improve transportation for themselves, and to what extent they have depended on private roads—of rails—built by outside capital.



A DIRT ROAD

THE SAME AFTER IMPROVEMENT

American Roads as Seen by Experts.

We have traced progress and prosperity from their beginning, and we have found that as if they were beings of discrimination, they invariably follow the course of roads and defined highways. Progress has ever been coincident with rapid travel and cheap freight haulage, made possible by roads and improved transportation means.

The Open Sesame.

The introduction and the extension of the highest type of road—the Railed Road—has resulted in the era of unprecedented prosperity and lightning-like progress, on the threshold only of which we stand to-day.

The roads of the United States consist of bad roads, good roads and Railed Roads Let us see to what extent we are provided with each of the several classes.

German Progress.

Our consul at Hanover, Germany, recently reported: "The worst German roads are better than the best roads in our own West."

The truth of this is substantiated by the small mileage of improved roads in this country and the condition of the others.

Worst Roads On Earth.

More than 60 years ago, William Mitchell Gillespie, professor of civil engineering in Union College, and an eminent authority on the subject, said: "The common roads of the United States are inferior to those of any other civilized country."

During the period from 1835 to 1855 very few miles of good roads were built. The common roads or highways were greatly neglected as the result of the dependence on Rail Roads, which then, as now, did the long-distance hauling.

"Miring Up" Progress.

But for the immense service rendered by the Rail Road industry, the wheels of progress and prosperity would often have sunk hub deep in roads such as those which constitute an overwhelming majority of our public highways.

A RUTTY ROAD IN NORTH CAROLINA.

NAVIGATING A BAD ROAD.

Logan Waller Page, in describing the roads in the vicinity of Jackson, Tenn., says that to allow travel at all in the winter, the levee roads had to be corduroyed.

Locked in by Mud.

In the "winter of big mud," 1902-3, the farmers were "locked in" and no attempt was made to use the roads except in cases of dire necessity. It took "a strong team of mules a whole day to draw a wagon and two cans of milk a few miles."

At a good roads meeting, the most effective speaker was a mud-caked farmer, who had walked to town because, although he lived only two miles out, the roads were so bad he could neither ride nor drive.

The Clinching Argument.

His clinching argument, the one that awakened the gathering, was that a few days before he had bought $5 worth of groceries, and had to pack them on his back to his saw mill. He explained that he would have bought $25 worth, could he have transported them by horse or wagon.

As a result of the meeting, a good road was built, and property values enhanced from 20 to 100 per cent.

Fourteen out of every 15 miles of road in this country are of

the type which, after a heavy rain, in many cases becomes semi-fluid to a depth of several inches.

Asia and America.

Anyone who followed the accounts of the New York to Paris automobile race, will remember that the cars found worse roads in the United States than in passing through Manchuria, Mongolia and Siberia.

Lost "in" Highways.

As the writer recalls, they were several times lost not on, but "in" the roads of some of our Western states. When they reached the far West, they could actually find no roads at all and had to take to the ties and ballast of the Rail Roads, which, in fact, are our only fit trans-continental highways. A lady who made a trip around the world in 1910, reported that while she had to replace her tires 24 times in crossing the United States, she required but 28 in her travel over the rest of the world.

The "Good Roads" auto recently sent by the "New York Herald" from New York to Atlanta, stuck fast in the mud of a Carolina road, and it took 15 men with a block and fall, to drag it out of the puddle.

The "Herald," in describing certain roads traversed by this auto, used such terms as "ditches," "quagmires," "a succession of ponds and pools," etc.

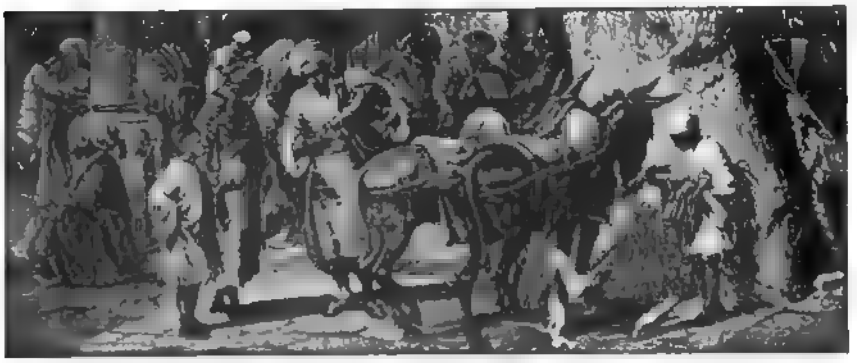
Ties Preferred.

Edmund Payson Weston, the long-distance walker, who recently "strolled" from New York to San Francisco and back again, found it desirable to leave the country roads and take to the Railed Roads for a large part of his jaunt, as better suited even to the pedestrian than the country roads.

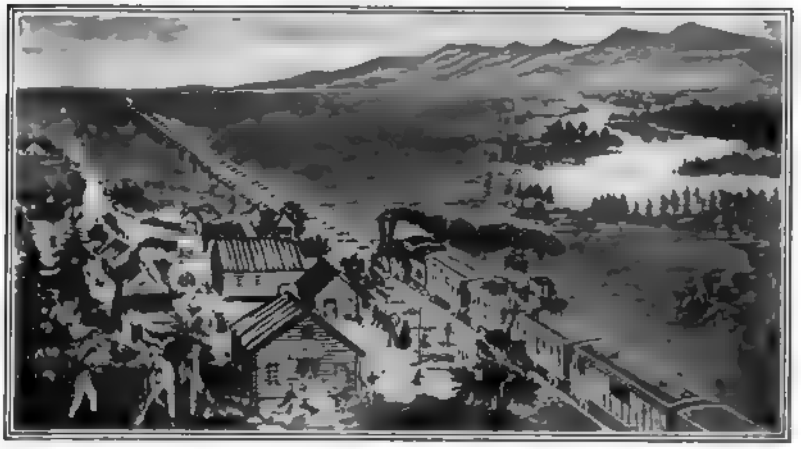
The Rocky Road.

"The Knights of the Road" all over the country follow the road of the rail, the ballast of broken stone usually furnishing better footing than country roads made of nothing in particular.

In fact, it was one of these "Roaming Citizens" who made fa-



Freighting in Arabia—A scene in Damascus



A Western pioneer Railroad station and settlement.

mous one of the first stone-ballasted Rail Roads in the West. The hobo said—and his description stuck to the road—"The Rock Island is the rockiest road I ever traveled."

As the writer recalls, in order to reach Buffalo from New York City, a distance of 440 miles, by other means than the Rail Roads, it took two or three weeks in recent winters.

A Wilderness in New York.

In the Adirondacks of New York state there is a section many miles in extent which can only be reached by Rail Road or canoe. The mere vestige of an old corduroy highway was found, but a man assured the writer that he had attempted to lead a horse over it, as he wished to sell the animal. He stated he would not attempt it again for the price of three horses, as at times he felt that not only the horse's, but his own life was in danger.

This region is by no means a deserted or unknown spot. It has a summer population of thousands of persons, but they can get in or out only by rail or canoe.

Our Highway Mileage by Groups of States.

113 Belts for the Earth.

Through the medium of the United States Department of Agriculture, the interesting fact is brought out that there are in actual use in the United States 2,155,000 miles of public roads, enough to reach 113 times around the earth in the latitude of our national capital.

This is exclusive of roads in the Indian Territory, Alaska and our island possessions, and also excluding streets, avenues, plazas and boulevards in incorporated cities and villages.

We find that of the total road mileage, only 153,600 miles, or little more than one mile in 15, are improved—the term "improved" meaning a road which, in addition to having been properly graded

AN AUTO RACE ON A GOOD ROAD.

and drained, has been so treated as to make it smooth, firm and durable.

Few Improvements. The department shows that in the United States there was then one mile of road to every 35 inhabitants, but only one mile of improved road for substantially every 500 persons. To each mile of Rail Road there is less than a half mile of improved road, and there are six miles of poor wagon road.

Roads and Rail Roads. One of the most important lessons to be learned is that the poorest states are the very ones in which the percentage of improved roads is the smallest. It is peculiar to note that those states which have manifested the greatest opposition to the Steam Roads, have the smallest percentage of improved roads.

On the other hand, the wealthiest states combine large Iron Road mileage with a large percentage of the nation's improved roads and proportionally large population.

The improved road mileage of the Central-Northern and Middle Atlantic groups combined, is 85,014, which is 55 per cent of the improved road mileage of the country. They have 487,951 miles, less than 25 per cent. of the country's unimproved roads.

Wealthy Sections. These two groups have only 12 per cent of the area of the country. But they have 46 per cent of all the Rail Road trackage. The two groups also have 52 per cent of all the wealth in the United States.

Adding only two per cent more of the country's area—that part embraced in the New England group of states—we find that the three groups, with a total of only 14 per cent of the country's area, boast 66 per cent of our mileage of improved roads, as against 28 per cent of the mileage of unimproved roads, 50 per cent of the Rail Road trackage, and 60 per cent of all the wealth.

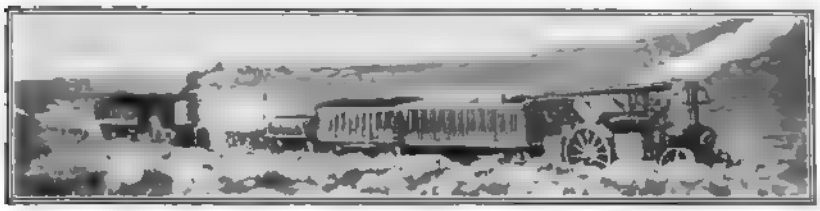
By Contrast. Is it mere coincidence that the Northwestern and Southwestern groups combined, having 43 per cent of the area of the country, and only nine per cent of the mileage of improved roads, but with 37 per cent of the bad roads, show up with only 21 per cent of the country's wealth?

How much these groups owe to improved public carriage, may be left to each reader's judgment with the statement that these two groups have 28 per cent of all the Steam Road trackage in the country, or about six miles of Railed Road to one mile of improved and 14 miles of improved roads.

Against Big Odds.

It would appear from this that the Rail Roads in those states are bearing a major part of the burden of development. They have built up these territories despite an adverse popular attitude toward both improved steam and common roads.

Which sections of the country would be hardest hit by the elimination of the Iron Road? Would it be where a large Railed and otherwise improved road mileage is serving a small region, or where a restricted and confined road mileage is serving an immense territory?



A ROAD TRAIN

Roads, Population and Wealth.

City vs. Country.

In 1790 only 3.4 per cent of our population dwelt in cities; by 1850 the percentage had increased to 12.5; in 1900 it was 31.1. Road conditions are perhaps an explanation; at least consideration of them throws light on the reasons for a situation under which millions and millions of fertile acres are lying untilled, while squalid city tenements, unsanitary and unhealthy, teem with life

Man is a social animal. In many cases, he prefers misery and want with companionship and contact of fellow beings, to prosperity and isolation. Good roads encourage immigration, settlement, development and staying near the soil; bad roads tend to the depopulation of the country and to congestion in cities.

Cause for Losses.

This is not a theory. The sections of the country which have the worst roads usually have lost in population. In 25 counties, selected at random by the Department of Agriculture from those with an average of only 1.5 per cent of improved roads in 1904, the decrease in population for 1890-1900, averaged 3,112 for each county.

Contrasted with this are 25 counties with an average of 40 per cent of improved roads, and a population increase averaging 31,095 to the county in the same period, ten times the increase of the others' depletion

Roads and Land Value.

The United States government reports to which we have referred, show also that in the 17 states and territories where the land is valued at an average of less than $20 an acre, the proportion of improved roads is only 1.9 per cent, or less than two miles in a hundred. In states and territories where the land is valued at more than $20 an acre, improved roads comprise an average of nine per cent of the total road mileage, while the Rail Road mileage there is 70 per cent of the country's total route miles, or 156,815.

Good Roads Make Value.

Farm lands in Mississippi are valued at $15.94 per acre, and in Indiana at $54.96 per acre. In Mississippi there is only one mile of improved road out of every 300; in Indiana the percentage is one mile of improved road out of every three.

Nothing seems more obvious than the effect of good or bad roads on prosperity and land values.

Unearned Increment.

In traversing country cut off from the markets by bad roads, one quickly notices the untilled land, the absence of mixed farming and the lack of variety in farm products. On the other hand, farm values are invariably increased by improvements in the roads; in some instances the advances in values following improvements have reached 500 per cent.

An adequate improvement of common roads would be followed by such development as to result in a greatly increased output of agricultural products and a richer nation, with cheaper living.

Improving Our Roads.

Wiping Out Bad Roads.

Considering the returns for the different sections of the country, it appears that the greatest economic problem to be solved by the country at large, in order to secure the best transportation results and consequently the greatest measure of progress and prosperity, is how to increase the mileage of both improved and steel roads.

The Rail Road industry does not appear to fear the competition of highways, however good, for the heads of many of the great Steam Roads are among the most earnest advocates of good roads.

In some cases they maintain "good roads trains," which tour their lines and endeavor to stir up interest in good roads, giving practical demonstrations of how to construct them.

A Queer Return.

Curiously enough the total expenditures for the maintenance and improvements of all the roads in the United States in 1904, the latest year for which figures are available, amounted to $79,771,417.87 in money and labor. Our Rail Roads paid in taxes in that year to the various states for the right of serving the public, $61,696,354. They are paying $90,000,000 now.

A ROAD BEFORE AND AFTER TREATMENT.

Paying for Other Roads.

In other words, the Rail Roads, besides maintaining themselves, practically are paying 75 per cent of the cost of maintaining and improving the common roads and highways.

The total of almost $80,000,000 pro rated among the 2,155,000 miles of road gives an average of only $28 a mile in money, and $9 in labor. England, with 150,000 miles of road, spent last year an average of $593 a mile, 16 times as much per mile. So large a sum is a considerable percentage of the cost of upkeep of a mile of Rail Road.

Instruction Lacking.

Not one farmer's son in 10,000 is taught even the A, B, C of road construction and operation, or knows much more in regard to that other and more important highway, the Iron Road, which every day of his life affects his personal comfort and the results of his labor.

It is to be hoped that a business-like system of road improvement will soon be introduced, so that the many commodities which are now without markets because of prohibitive transportation costs, may find an outlet to points of consumption, and land distant from transportation brought into productive use.

The Great White Plague.

It is not fully realized that our extensive mileage of poor roads constitutes a fruitful source of disease. As an example, germs, particularly those of the great white plague, are said to enter the system by means of dust. Those competent to speak on the matter assert that much of the diarrhoeal and sore throat illness during the summer is due to microbial infection conveyed by dusty roads.

Agriculture, the production of our food supply, which is not only of general but of most intimate interest to us all, is in many ways dependent upon good roads for success and reward.

The Backbone of the Nation.

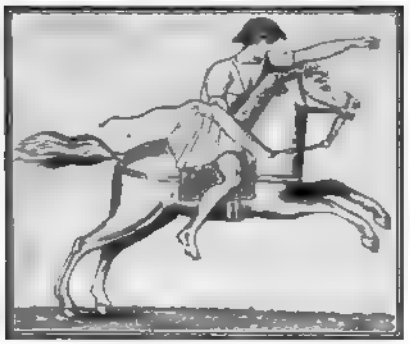
If man would thrive by the plow, it must be by bringing it into proximity with the loom and the anvil. While he is tilling the soil, some one must be weaving, another mining, and many others doing the hundred other things necessary to supply his many and varied wants, in return for the wants he is filling for them.

The cities and towns, the best consuming markets for farming produce, are enabled to grow by the construction and betterment of the roads of all kinds leading to them. In this way, the agriculturalist's business is indirectly benefited.

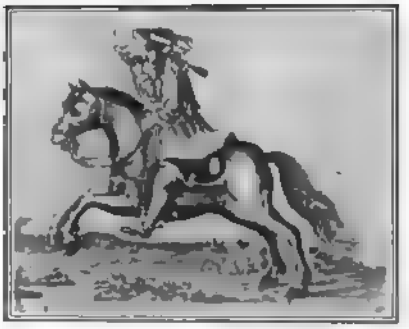
Road or Water. The good road occupies the same position as the water course, to the banks of which great towns were confined in the early days, when we had no improved highways, and to which the farmer would have to haul his produce to-day in order to ship it thence to the market if early conditions were existing now. Only water could have afforded accommodations to carry sufficient supplies to great communities.

This brief but important review seems to establish a very close relation between good roads, bad roads, and Railed Roads, and a still more intimate relation between the people, the roads, and the progress and prosperity of nations.

HAULING ACROSS WYOMING.



ROMAN MESSENGER.



GERMAN POSTAL MESSENGER, 1650.

SECTION XXV.

THE POSTAL SERVICE, EXPRESS AND BAGGAGE.

The Dial of Time.

The machinery that governs the "world movement" is vast and intricate; the postal service is one of the principal pieces of the actuating mechanism. The postal receipts furnish a popular barometer of the progress of man, and give us light on his prosperity.

Time is of more value to-day than at any previous period in the world's history. The new day follows closer on the old, the new year treads sooner on the heels of its predecessor. We progress more in a day than our fathers did in weeks. The achievements of a year would have bewildered our ancestors if they had been the results of a lifetime of effort.

The Marathon of Ages.

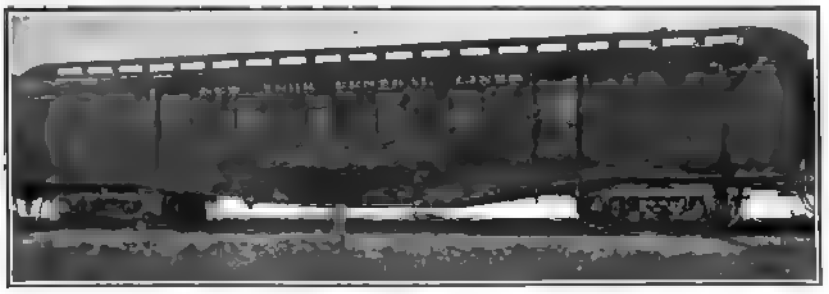
We have been accustomed to depict the new year as a beautiful child, the old as a venerable patriarch, hour-glass in hand with its sands run out. By modern measure, the activities of life keep the year from growing old, and the passing time can more properly be depicted by a strong and vigorous athlete touching the hand of the younger, fresher and even more vigorous runner, who is to continue the relay race of the centuries.

There is no need for the hands of progress and prosperity to make only a single revolution every 24 hours. The measure of the past is not the measure of the present, nor is the measure of the present that of the future. The machinery is quickened, and the hands may make their former diurnal revolution once an hour, and nothing be disarranged or harmed by the acceleration.

Thought Transference.

Many scientists, whose names are upon the world's scroll of honor, are puzzling over the problem of thought transference. But in our postal service we have physical thought transference.

The postal system has grown so intimately into our lives that it has almost become a subconscious part of our everyday existence. As a result, we pass over superficially, and take little note of what has been done, is being done and will be done by this factor, in promoting and developing the world's intelligence, its great religion of broad humanitarianism, its progress and prosperity.



RAILWAY POSTAL CAR

The Postal Service of To-day.

The Service.

In 1910 the postal service of the United States required the expenditure of $229,977,000 in connection with our 59,580 postoffices. The number of pieces of mail matter handled was 14,850,000,000, or 150 for each man, woman and child in the country.

The weight of this mail was 1,300,000,000 pounds; the bags, sacks, and other equipment necessary to handle and transport it over the mail routes of 447,998 miles, weighed approximately 950,000,000 pounds; the total weight equals almost a pound and a half for each of the world's inhabitants, or a fraction less than 24 pounds for each man, woman and child in the nation.

The Rail Way Mail Service.

In the Rail Way Mail Service the equivalent of 15 regiments—an army of 15,486 officers and clerks—is directly employed at a cost of $18,300,000 a year. They have the assistance of 7,654 messengers.

The total number of employes in the whole postal service is

323,611, four and one-half times the present strength of the United States army, and seven times that of the navy. The number is equal to the population of the city of Cincinnati, or the combined population of the cities of Indianapolis and Albany.

Shipping Money.

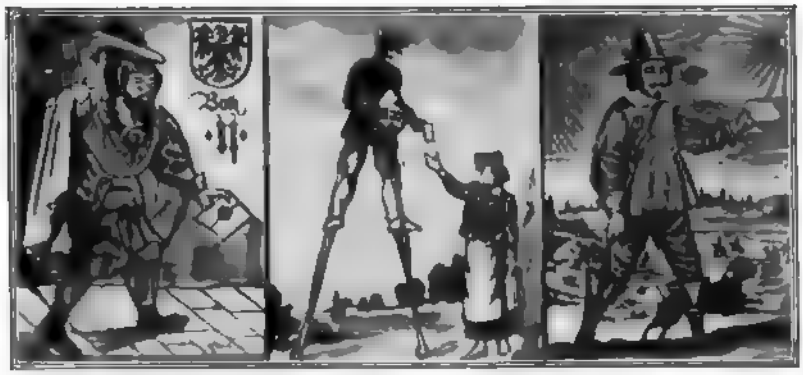
The number of domestic money orders issued by our postal department in 1910 was 99,742,686, calling for the payment of $547,993,641; foreign money orders were $76,750,000 additional.

Let us see from what the system has sprung. In the early periods of society there was little necessity for communication between distant parts of the world. As civilization advanced, the post resulted as a logical step in the progress of the human family, filling the need for communication which had arisen.

This great institution to-day bears a vital relation to the life and activities of the world, for the field of its operations influences and extends into every branch of the life of the human race.

Many Sided Interests.

Connected with commerce, a fiscal order transmitted by it, has all the potency of the wand of Merlin; in the arts it brings the thought of nations together by a few strokes of the pen. Besides carrying tidings of joy and sadness between friends and families, it has been the mighty means of disseminating news, of heralding scientific discoveries, spreading knowledge, and of circulating and extending religion and its teaching of peace, as well as to declare the dread formalities of war.



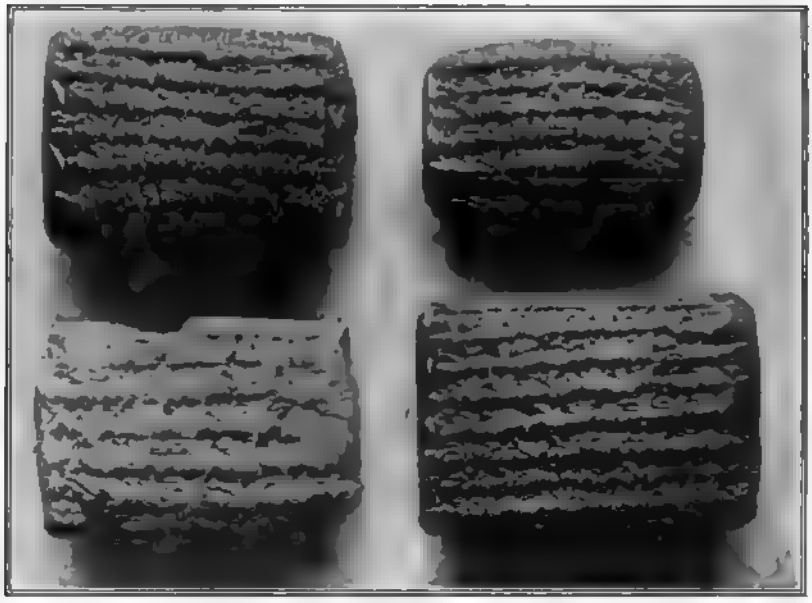
VIENNA POSTMAN 15TH CENTURY. EARLY GERMAN POSTMAN ON STILTS. NUERNBERG POSTMAN, 17TH CENTURY

The First Letters, Pens, Ink and Paper.

The First Letter.

The principal function of the postal service is the transmission of letters, and some fascinating facts are found in the genesis of the letter.

The Bible furnishes the earliest record of letter-writing. Very properly, this letter-writer was a woman, Jezebel, upon an occasion when she wished to send a message to some one beyond the reach of her famous tongue. It is not recorded whether



WRITING TABLETS, 2000 B. C.

Jezebel wrote a postscript to her letter, but in the first book of Kings we read:

"So she wrote letters in Ahab's name and sealed them with his seal, and sent the letters unto the elders and to the nobles that were in his city, dwelling with Naboth."

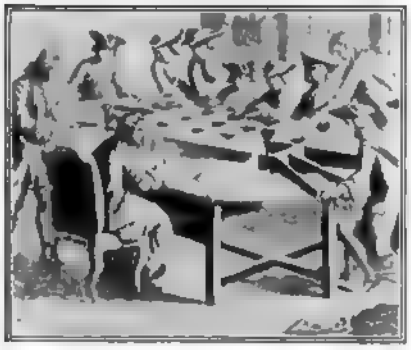
Ancient Letters. A letter in those days was generally written on a parchment which was rolled around a stick; for a long letter two sticks were used, the letter being rolled upon them from each end.

We have authority for believing the antediluvians had a form of writing, for it seems scarcely possible that the account of before the flood genealogy was preserved merely through oral tradition. In Genesis there is the statement, "This is the book of the generation of Adam." In fact, the entire five books of Moses carry with them evidence of a compilation from earlier written annals.

Early Writing Surfaces. The earliest writing was picture writing on rocks, on bricks and on tablets of stone, later writing was done on plates of various materials. It is not hard to conceive the amazement which would be written on the face of one of our twentieth century letter-carriers, were he to run across such a letter as this in his pouch

The table received by Moses, and bearing the ten commandments, was of stone and written on in letters of gold, by the hand of God.

From the films of bark peeled from the reed papyrus, which grew along the banks of the Nile, the Egyptians early formed a ma-



POSTOFFICE IN THE TIME OF LOUIS XVI, FRANCE.

ENGLISH POSTMAN, 1830

terial which was more convenient and served far better as a writing surface than did the materials which it superseded.

Immortal Plant. The word papyrus of the ancients is perpetuated in our word "paper." The name of this Egyptian reed has lived through the centuries, and has in turn been applied to the materials formed of a base of cotton, linen, straw, wood pulp, and other substances which have been developed since papyrus was our writing surface.

Although at first a small brush was used, reeds were early formed into pens. Pens were not fashioned from quills until about the fifth century. Those of steel came into use only with the last century.

The first inks were probably obtained from the cuttle fish. Much of it was also made from carbon pigment, being similar to that still used by the Chinese. These inks were heavier than the substances employed at present. Subsequently lamp black, burnt bone, ivory, soot and nut galls formed the bases of inks. To-day our writing inks are almost entirely chemical compounds.

The Dove the First Carrier. The first carrier, or messenger, of whom a record has been kept, was the dove that Noah sent out from the ark, and which returned with its good tidings in the form of an olive branch. Apparently this messenger had no difficulty in finding the addressee.

The First Posts.

In China posts existed from the earliest times. They were called jambs, and the stations were placed 25 miles apart. Horses were used in the carrying of messages, and Marco Polo asserts that at the most important of the 10,000 stations, there were frequently 300 or 400 of these animals in waiting. Two hundred thousand horses were engaged in the service.

The First Post Rider. Cyrus is believed to have originated the idea of the post rider, 599 years B. C. This was probably the most important of his many inventions.

Augustus, who is said to have found Rome built of brick and left it of marble, established an efficient imperial postal

service, which was so thorough that it practically covered the roads of the great Roman empire.

Although at that period letters were written only on occasions of great importance, the post was nevertheless a valuable factor in Rome's political and commercial life.

In Germany, until long after the German states had become independent, the house of Thurn and Taxis held the exclusive postal service as a right of fief, granted them by Charles V. in the first half of the sixteenth century.

The Riding Post. The regular riding post system owes its origin to Edward IV. of England. It was established in the latter half of the fifteenth century. This answered the demands of the government as well as the requirements of business.

England's first mail coach went into service August 2, 1785, more than a decade after the establishment of mail coach service in the United States. Although the postage rates were slightly raised after this service was instituted, and in 1801 were advanced from a penny to two pence, the business increased wonderfully. In the first year the net revenue of the postoffice was about £250,000, or $1,250,000 in our money. After 20 years the net revenue had increased to £1,500,000, or $7,500,000.

Colonial America's Mail Service.

In the Land of Progress. In America, Massachusetts, as early as 1639, ordered that all incoming or outgoing foreign letters at Boston, which previously had been left at the wharves, should be left at the house of one Richard Fairbanks, making him responsible for their proper dispatch and delivery. This marks the advent of the first colonial postmaster.

The delivery of inland mail was unimproved until many years after. Private correspondence was obligingly carried from place to place by travelers; correspondence between colonial governments was handled by special messengers.

In Regular Channels. The first regular mounted postman of the colonial period is said to have ridden from Boston to New York, by way of Hartford, in 1673. The schedule was a monthly one. In 1674 a law of Massachusetts fixed the pay of such post riders at three pence per mile.

In February, 1692, the English government created a postal service, and issued letters patent to Thomas Neale, giving him authority to select a body of local postmasters throughout the colonies. This project was to be merely a private business. Neale made Andrew Hamilton his deputy postmaster-general, with executive powers.

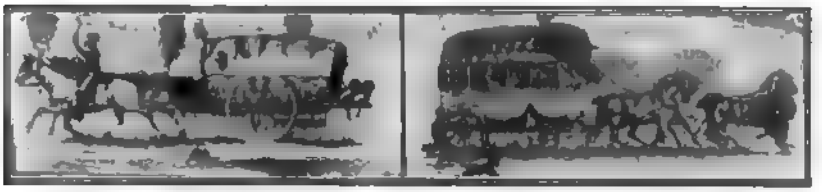
A Thrifty Nation. The high rates of postage which prevailed, particulars of which are given in our "Then and Now," did not commend themselves to people who had been accustomed to free postal service by obliging friends. The system was ignored to an extent that forced the

postmasters to beg salary allowances from the various colonial councils.

On May 26, 1703, John Campbell, deputy postmaster at Boston, submitted that the income was below the expense of conducting the service, and that the department was indebted to Colonel Hamilton, who was postmaster of North America, in the sum of 1,400 pounds sterling, or about $7,000 in the money of to-day.

The Redemption. The postal service was not "taken out of pawn" until 1706, when the English government paid Hamilton's widow £1,664 sterling, about $8,300, redeemed the department and assumed its management.

It seems that "In 'hock' signo vinces" in that day might have been a fitting motto for our postal service.



MAIL POST UNDER NAPOLEON I ROYAL POST UNDER LOUIS PHILIPPE.

The service seems not to have shown any very marked improvement under royal control, for in 1772 a Philadelphia paper stated that "the New York post is three days overdue and has not yet been heard from."

Mails Once a Week. Mails were sent out from the chief cities about once a week at this time. In winter, once a fortnight was deemed often enough. The announcements of the expected or scheduled arrivals of the mails were always prefaced with the qualification of "weather permitting."

In 1739 it became necessary to appoint a "Riding Postmaster" for routes between Philadelphia and Virginia.

In 1753 the British government, finding the American postal system unprofitable, conferred the deputy postmaster generalship on Benjamin Franklin and Walter Hunter jointly. In that year the Philadelphia post office had a radius of 60 miles.

Franklin Dismissed. Franklin was dismissed as postmaster of the colonies in 1774, because of his patriotic attitude, but soon afterward he was made postmaster-general by Congress. Under his management the postal department enjoyed one of those few periods when its receipts exceeded its expenditures.

In 1773 the first American mail coach was used, the carriage having been built expressly for post road service.

ENGLISH POSTOFFICE, 1850.

Early Service in the United States.

The End of the Beginning.

In the latter days of the Revolution a wonderful tide of immigration and general travel set in. The trips of the post riders, however, were the nearest approach to systematic or regular carrying service that existed anywhere in the country.

In 1783 Captain Levi Pease set out as driver of a fast coach, making trips between Boston and Hartford on a regular time schedule. The Pease line, after the first year, was a success, and other lines sprang rapidly into existence all over the country.

From 1786 onward the new stage coaches began to be favored with contracts for carrying the United States mail, the time schedule making them of value for this work.

Speedy Progress.

How many fold this splendid assistant to progress and prosperity has grown can be appreciated only when we realize that to-day there are few of our 3,000,000 square miles which cannot be reached with almost incredible speed by the mail, nor a section of the country not at least in touch with a post office

In 1798, 15 years after the close of the Revolutionary war, the number of post offices in the United States was only 75. The gross postal revenues were only $37,965, and expenditures, $32,140. The total length of post roads was 1,875 miles.

The postal routes to-day cover 450,000 miles, or two hundred and forty fold the mileage of 1798, having added the original mileage every five months and eighteen days.

Restricted Convenience.

Even as late as 1815 letter rates prevailed which would be considered extortionate to-day. Under 10 miles the charge was 6 cents, 11 to 60 miles, 8 cents; 61 to 100 miles, the charge was 10 cents; 101 to 150 miles, 12 cents; 151 to 200 miles, 15 cents.

The American newspaper press became of national importance in the beginning of the nineteenth century For years, however, the carrying of newspapers was a thing apart from either stage or postal service.

The then "bulky" output of the presses would be smiled at

to-day. Probably the aggregate of the country for a week would not equal in weight the Sunday issue of a single newspaper published in any second-class American city to-day.

The Newspaper Carrier.

The newspapers were distributed usually by post riders, mounted newspaper carriers, who contracted with publishers for their service, oftentimes purchasing the papers in quantities and selling them to the buyers at prices which insured a profit.

That the delinquent subscriber is not a modern type, is evidenced by an advertisement published in 1833 in a Worcester, Mass., newspaper, by Denny S. Noyes, a post rider. Noyes set out a schedule of the days on which he would be at certain places for the purpose of settling with his customers, and he added:

"It is now about three years since the subscriber (Noyes) commenced carrying newspapers on this route, and there are a good many persons (much to their shame) who have never paid him a single cent, although they have had the newspaper carried to them regularly and faithfully every week, rain or shine.

A Familiar Threat.

"He is now determined to have a settlement with ALL who are in arrears, and he hopes delinquents will look out that their grists don't get into the law mill, as they inevitably will unless settled immediately."

It does not appear that the men who had the destiny and management of the mails in their care in the early nineteenth century made any attempts to establish records in the course of operating their business.

It was always the attempt of the postal rider or driver to reach his destination on a day which would not compel him to spend Sunday in travel on the road. Did he fail in that, however, he considered his duty sufficiently well done if he reached his destination by the Sunday following.

EARLY AND NEW POSTOFFICES, NEW YORK.

Relay Riding. Relay riding was arranged for news of great importance, or for delivery of a president's message. This latter event was often taken as a test of efficiency when mail contracts were to be let.

AN ALL-MAIL TRAIN.

The Rail Road the Great Mail Carrier.

When Rail Roads Came. While the Rail Road was yet in an experimental stage, the heads of the postal service began to consider it as an agency for the carriage of mail. In 1835 Postmaster-General Kendall suggested that the Baltimore & Ohio be asked to close in a portion of its baggage cars for the use of the mails.

The triumph of the Rail Road system as an assistant to the mail service was marked in 1838 by the passage by congress of an act declaring every Rail Road a post route.

The Traveling Postoffice. The real inauguration of the United States Rail Way mail service came in 1862, when the postmaster of St. Joseph, Mo., found his office swamped by unassorted mail from western points. He sent William A. Davis to meet eastbound trains to sort the mails on the trains as they moved toward St. Joseph.

A similar congestion of mail at Chicago, owing to bulky receipts from the army camps, caused George B. Armstrong, the assistant postmaster, to devise a remedy of the same sort. Armstrong, however, planned a permanent system of Rail Way postal service. On August 28, 1864, the first experiment of his plan was made with a car run on the Chicago & Northwestern from Chicago to Clinton, Iowa.

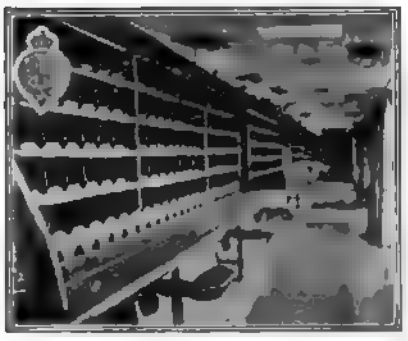
General Experiments. In October of the same year a postal car was run between New York and Washington. A month later a postal car went into operation between Chicago and Davenport, Iowa. These having all accomplished the work claimed for them, the "Rail Way Postoffice" was recognized by legal enactment in 1865.

Fast Mails. The era of fast mail trains over the great trunk lines began in 1874, when Postal Superintendent George D. Bangs arranged with the New York Central that a fast passenger train between New York and Chicago should carry through mail. The Pennsylvania Rail Road also put on a fast train at this time.

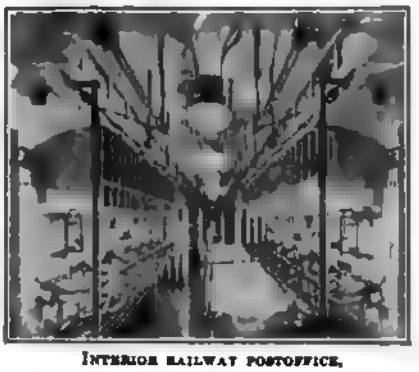
The Rail Way Mail Service.

The Rail Way mail service to-day is conducted by the government, in cars specially provided by the Rail Roads for the purpose. These cars are fitted up very much like modern postoffices, and the work done in them is much of the same nature. Between important centers, fast and exclusive mail trains are operated.

16,500 Equators. The mail cars number 4,910 and would make a solid train of traveling postoffices approximately 60 miles long, two-thirds of the distance from New York to Philadelphia. The mail trains traveled 553,000,000 miles in 1910, equal to circling the earth at the equator 22,120 times, 60 times every day; in another way, this distance is equal to taking two round trips to the sun, with a trifle of 282 round trips to the moon, as side journeys.



Interior of a Railway Postoffice, England.



Interior Railway Postoffice, America.

A Rail Road train going 60 miles an hour would travel continuously for 1,052 years to cover the distance. By that time the train would be ready to enter a museum, labeled "An interesting relic of transportation in the ante-Martian correspondence days of the Twentieth Century."

Water Ways Utilized. Steamboats also have been fitted up with "traveling postoffices," and in the Rail Way mail service there are 215 steamboat routes, covering 29,870 miles, or almost ten times the length of the Mississippi river from its source in Minnesota to where it mingles its water with that of the Gulf of Mexico.

We have also our "sea post." American postal messengers travel on our transcontinental steamers and handle the mail on its way across the ocean, sorting it by states and cities, and for some

of the latter, even by streets, so as to avoid delay after the vessel gets in. In the harbor of New York two small boats known as the Postmaster General and the President, meet the incoming liners, and the mail is transferred aboard them. It is then hastened to the Rail Ways direct, often being on its way to interior cities before the ship is made fast to her dock. Practically all trains in the postal service have mail catchers. By means of various devices, without stopping or delaying the train, mail is taken on and put off at local stations. Pneumatic tubes, mail conveyors, etc., further expedite the handling of mail.

Catching Mail.

The Iron Roads in this way have put all sections of the country into close touch with each other, regardless of distance, enabling the people of the nation, for the nominal sum of two cents, to reach one another by letter practically as quickly as could be done in person. It is even proposed to cut the rate to one cent.

Stupendous Importance.

Its great significance escapes notice because it is such an every-day affair. Yet how inconceivably have business and other interests been facilitated and advanced by the postal service as developed with the aid of the Railed Roads! If the parcels post is adopted, the public service of the department will be greatly added to.

The progress of the mail service, enabling the transference of thought, the nation's real elixir of life, has only kept step with the tremendous advance of modern transportation

A Wallachian Express

EXPRESS.

Seventy Years' Growth.

The express business has become almost an indispensable feature and convenience of our commercial life. It has played considerably more than a thinking part in the drama of progress and prosperity. Seventy-five years ago the industry was practically unknown.

Its origin and development have been intimately connected with our Railed Road industry, without which the business would still be in its swaddling clothes.

Quarter Million Mile Service.

The express business in the United States to-day covers 235,000 miles of Rail Road, steamboat and stage lines, twenty-nine times the distance from New York to Buenos Aires. Annually 100,000,000 packages of merchandise and 20,000,000 packages of money are transmitted by the service.

Over 14,000,000 money orders are issued a year by the 40,000 express agencies scattered throughout the country, calling for an aggregate payment of $147,000,000.

This industry, starting obscurely not so many years ago, to-day has a capital of $60,000,000. It carries on its pay roll 80,000 men, who receive an aggregate of $40,000,000 in salaries.

In the Good (?) Old Days.

Before the advent of the Rail Road, packages and parcels were entrusted to persons traveling by stage coach.

When the kind messenger carrying a bit of lace from Baltimore to New York met a more than ordinarily pretty face, or comely figure, at a halting place, that bit of lace was just as likely to adorn the damsel's fair throat as that of the lady for whom it was intended.

Or, when mine host at the inn put an extra "stick" into the toddy, or brewed an extra number of them, it frequently caused complete forgetfulness of the promised delivery.

A little later it became the custom to seek out the coach drivers and give the packages to them, making the best financial arrangement possible.

"Thy Sins Upon Thy Head."

An early writer mentions that many stage drivers became prematurely bald as a result of the many letters and parcels carried in their hats.

When the stage coach was superseded by the Rail Road, there was a transfer to the Rail Way conductor of the obligations which had been assumed by the stage coach driver.

In time the demands made upon the Rail Way and steamboat employes for the carriage of packages became so great that their superiors required them to make a choice between acting as agents of the public or of the transportation companies.

The Pioneer Expressman.

Harnden.

One of the first Rail Roads to enforce this distinction was the Boston & Worcester. William Harnden, who was among the number dividing time between being paid by the company and serving the public for a consideration, thought it would be more profitable to leave the employ of the Rail Road. In 1838 he came to New York to establish as an individual enterprise the carriage of parcels, the purchasing of goods and the collection of notes, drafts and bills, between New York and Boston.

Harnden was his own messenger, and made the trip three or four times a week.

THE PIONEER EXPRESSMAN.

Adams. Alvin Adams came from Vermont to Boston in 1840 and founded the express service between that city and New York which, under his name, has since become of great power, and is a household word in the land.

The success of those lines led to the establishment of others, and between 1840 and 1845 express routes were opened from New York to Albany, Philadelphia, Baltimore, Washington, Buffalo, Pittsburgh, Detroit, Chicago, Cincinnati, Louisville, St. Louis and New Orleans.

Express Speed. Express business in the then West was conducted almost wholly over the waterways of the Great Lakes, the Ohio, Mississippi and Missouri rivers and their tributaries, which included canals built to connect these rivers with the lakes.

A modern merchant or any other person can scarcely restrain his risibles at the thought of an "express" package moving toward him at the snail like "hustle" of two to three miles an hour, the average speed made by canal packets.

Letter Carriage. Shortly after their establishment, the express companies also undertook the carriage of letters. The service was more satisfactory than that of the government post office, and made deep inroads into its postal revenue. Uncle Sam opposed this innovation by the express companies so strenuously that the competition was abandoned.

Soon after the discovery of the gold fields of California, in 1848, when great numbers of persons flocked to the new Eldorado, the express companies anticipated the necessities of the argonauts for prompt and reliable commercial intercourse with the East.

Agencies were opened in San Francisco and in the various mining camps for the transmission of packages of money and gold dust, and the transaction of a general banking business. Handsome profits were made by the express companies in these transactions.

Consolidation. For several years prior to 1854 the tendency of the express companies had been toward consolidation of interests, with better, more prompt and less expensive service as the objects.

In that year, Harnden, Adams and several minor express companies in the Eastern states, and the expresses operating on steamboats between New York, Charleston, Savannah, Mobile and New Orleans, were combined under the title of "Adams Express Company."

The Wells, Livingston, Fargo and Butterfield expresses, operating from New York to the far West, via Albany, Buffalo, and the Lakes, consolidated into the American Express Company. The United States Express Company also was formed in the same year.

The "Pony Express." In the next few years several concerns operated stages between St. Louis and San Francisco, and established the famous "Pony Express" across this territory.

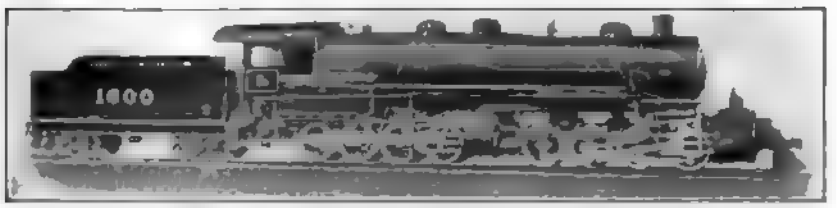
The Wells-Fargo Company was the most important of the several companies in that field, and in 1858 associated the others with it for the formation of the Overland Mail Company. This company, until the completion of the Union Pacific Rail Road, carried the United States mails between the Missouri river and the Pacific coast. The charge for letters written on the thinnest tissue paper, taken across the continent by the pony express, was $5.00 each.

Election Returns. During the Civil War the express companies collected the vote cast by the absent soldiers of certain of the Northern states, forwarding the ballots from camp and battlefield to the respective state capitols.

Securities issued by the U. S. government during the war were transmitted to their purchasers by express, the government recognizing the service as safer than its own mail. At the solicitation of the government this service was continued after the war, and a contract was made whereby the transmission of all the securities and moneys of the United States was confided to it.

The Horse as an Adjunct. The development of the express service necessitated the introduction of delivery facilities from and to Rail Road stations. To-day more than 15,000 horses and 6,000 vehicles are employed in this department, the number of horses being much larger than that in the cavalry branch of the United States army.

The express companies have created the business of transporting with dispatch, game, poultry, fish, fruit and other delicacies to



THE LOCOMOTIVE HAS SUPERSEDED THE HORSE AS THE EXPRESS CARRIER.

localities where they are not otherwise procurable or not in season, widening the market, making possible the sale of many by-products of the farm, and putting toothsome dainties at our disposal.

A Business-Getter.

A business originated by the express companies, which has proven profitable to the merchant, is that of sending merchandise "C. O. D." and "on approval." The express companies collect negotiable paper, and imported goods are now taken from the port of entry to the importer, even though he may live far in the interior, the express company acting as a bonded carrier.

During one recent year over $4,000,000,000 in money, almost a billion more than every dollar in the country, was handled by the express companies, and not one cent went astray. Of this $1,500,000,000 was carried for the United States government.

If such responsibility is placed in the express companies, it can be surmised to what an extent we may look to this phase of transportation for further contributions to our convenience.

The parcels post will doubtless come, but there will still remain a field for the express companies for the transmission of valuables and other articles.

BAGGAGE WAGON 1810.

BAGGAGE.

Something for Nothing.

It is seldom we get something for nothing, yet the baggage service of the United States comes very near to that "millenium." Its importance may best be reckoned when it is considered that the service rendered free in this country, would add materially to the cost of travel if charged on the basis that prevails on European Rail Roads.

It is said to be unwise, or at least ungenerous, to look a gift horse in the mouth, but let us lay aside the traditional injunction and peer into the mouth of this gift horse, or, more properly, this gratuity from the iron horse

Two billion dollars' worth of baggage, more than 11,000,000 pieces, are handled annually by the Pennsylvania Rail Road alone, as reported by that company's general baggage agent.

The Losses. The claims made for accidents to or losses of this enormous number of pieces amounted to little; in fact, almost half the entire sum paid out by this Rail Road for indemnities in this direction in a whole year, was for nine trunks, less than one piece out of each million carried.

A charge is made for each day that the baggage is left at the station. The thousands of pieces of baggage left in the depots of the prominent cities cause tremendous congestion, but unless such charges were made, the stations would be filled still more and become merely warehouses to save storage charges to travelers.

100,000,000 Annually. The baggage handled in the United States each year doubtless considerably exceeds 100,000,000 pieces, which is carried gratis, except for the small charges made for excess baggage.

The aggregate value must be enormous—probably $18,000,000,000 to $20,000,000,000. Yet the Rail Roads practically are compelled not only to transport the greater part of it without charge, but to insure it, free of charge, calling for a material outlay.

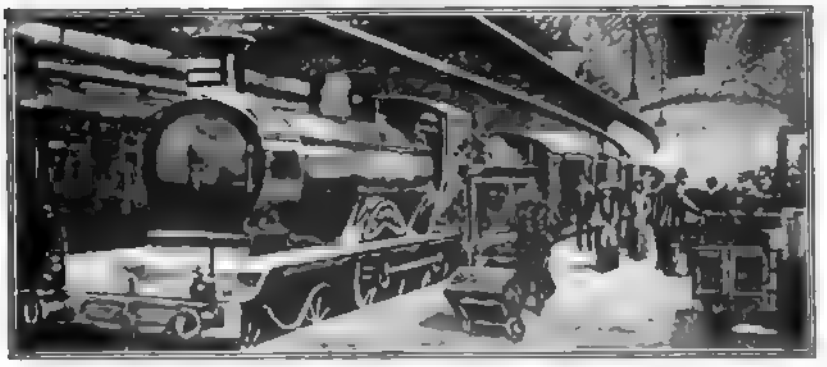
The Cost of Handling. The cost of the baggage service aggregates a tremendous sum. Nearly all passenger trains require one and sometimes two extra cars and a traveling baggage master.

At all important stations there must be a large number of baggage agents, handlers and porters, and at junction points it is necessary to have a special agent and assistants for the purpose of transferring this baggage from one train or road to another.

The cost to the Rail Road of this baggage service forms a substantial deduction from the one and ninety-three hundredths cents a mile which we pay as passenger fare.

America Versus Europe.

In our country to-day, when we see an English traveler, we are able to "place" him immediately, because he has such a large amount of impedimenta in the form of hand baggage, carry-alls,



HANDLING BAGGAGE AT AN ENGLISH STATION.

satchels, and rugs, seeming sometimes to amount to a hand cart-load.

A Great Inconvenience.

The reason is apparent to those who have traveled abroad. The uncertainty and inefficiency of the foreign baggage system, as well as the high tariff charged on even a minimum quantity of "luggage," makes one desirous of entrusting as little as possible to the tender mercies of this department. In our section, "European Rail Roads," some interesting examples are given of the cost of this service.

As a rule, at a station abroad, it is necessary to identify one's trunks, and then to employ a porter to carry them into the station, and sometimes in and out of the cars.

Unpleasant Delays.

On one occasion it took two days before the writer received back his baggage, from which he had become separated, though it had to be shipped only about 20 miles; in another case it took the same time for a journey of perhaps 80 miles.

The writer also remembers having to pay $1.75 for the privilege of checking a large dress suit case from Vienna to Carlsbad, an eight-hour ride. On another occasion he was compelled to check it at a cost of about $1.00 for 70 miles.

Texas to New York.

In contrast to these experiences, the writer remembers an occasion when he reached the Fort Worth, Texas, station, only a few moments before his train pulled out. He managed to get his baggage checked and catch his car, but the baggage man had not time to get the baggage to the front of the long train.

At St. Louis, where a change was made to the Illinois Central, the baggage master at the Union depot, on being told the situation, gave the writer an exchange check, although the baggage, of course, was not on the train, and the journey was resumed as far as Chicago.

A Follow-Up System.

There, the situation having been explained again, the Parmelee transfer agency exchanged checks with the traveler; at the Michigan Central depot in Chicago another exchange of checks was made, and the last lap of the trip to New York was commenced.

The next fast through train for St. Louis left Fort Worth 24 hours after the one on which the writer left. The evening after his arrival in New York, desiring to use something from the baggage, he sent a messenger to the depot on the bare possibility that the baggage might have arrived in New York.

Welcome Home!

It was waiting there; it had made the trip from Fort Worth to New York City, including the transfers, at the same express speed at which its owner traveled.

The convenience of baggage men passing through the trains, checking trunks and arranging the delivery of baggage from the station, is practically unknown in Europe.

House to House. In the United States, for practically the cost of delivery by baggage wagons, one may have baggage checked from the residence in one city to one's house or hotel in another city, without seeing it from the time it is packed in the room in one place until it is delivered in one's room in the other.

The free carriage of personal baggage by Rail Roads is a survival of stage coach days, when travelers took their belongings with them under their personal care. In the first few years of American Rail Roading the amount of baggage which was carried free for one passenger was 14 pounds. Baggage then was carried in racks on top of the cars, special cars for baggage not coming into use until several years after the Baltimore & Ohio was in operation. To-day one may carry gratis more than ten times as much as then.

Concessions. At one time a special concession of 250 pounds was made for the transcontinental passenger. This was in competition with the Isthmian steamships, which allowed a certain space free for a passenger's baggage. Special concessions are made to-day to commercial travelers and theatrical companies.

Baggage is in no uncertain sense an evidence of modern comfort and prosperity; if we were not prosperous we would perhaps have no baggage.

Wealth. The late Mark Twain told of a man who was walking along the street with a cigar box under his arm when an old woman stopped him and gave him a lecture about cigar smoking.

"But I don't smoke cigars," protested the man.

"You don't?" said the old woman. "Why, you have a box of cigars under your arm at this moment."

"Yes, I know. But there are no cigars in it; I'm moving again."

THE WORLD AS KNOWN TO THE GREEKS.

SECTION XXVI.

THE OCEAN RAIL WAY.

ITS PREDECESSORS AND EVOLUTION—THE TRADE ROUTES OF COMMERCE.

Where the sea intervened, intercommunication and with it progress and prosperity had to halt till navigation was developed.

The Ocean Locomotive.

The world to-day is but a globe inclosed in a network of steel on land and sea The late Sir Samuel Cunard, founder of the Cunard Line, used to say, jocularly, that while rails were needed on the land, "the steam marine locomotive on the beautiful level sea needed none." The steamship is but the sea locomotive engaged in transportation on the ocean.

Indeed, the application of steam to ocean vessels and the running of steamships upon practically beaten paths and on scheduled time makes it difficult to find a more descriptive term for modern ocean carriage than "THE OCEAN RAILWAY," which is in fact the title of an interesting volume published a few years ago by A. Fraser-Macdonald, a well-known English writer.

A Four-Track Sea Rail Road.

The ocean route between Europe and New York may well be described as a "four-tracked Rail Way," for vessels going East keep slightly out of the recognized path for those coming West, and in winter, in order to avoid fogs and icebergs, a more southerly double-track route is employed.

The relation of land transportation to sea carriage appears most intimate when we consider that in many cases Rail Roads connect with the steamships in the same way as with other lines of Rail Road, and that nearly all will transport passengers or freight on a through ticket to a destination in almost any part of the earth by land and rail, thus making them integral parts of the through carriage system.

The Rail Roads are links essential in bringing from inland enormous cargoes to fill the great modern steamships, while these complete the commercial routes which carry the world's traffic to the far parts of the earth.

AN ANCIENT BARGE UPON THE NILE.

The Beginning of Water Transportation.

Since trade had its birth, transportation has been the medium through which it has grown in volume. Transportation had to find its way along and depend upon certain well-defined trade lines and routes, upon both land and water.

The River Highway.

According to Adam Smith, the famous political economist, the earliest important centers of trade and civilization, Egypt and India, owed their origin to the facility of intercourse afforded by their rivers, the Nile and the Ganges, and their tributary canals and streams.

Nineveh and Babylon, early centers, owed their wealth and prominence to the Euphrates and the Tigris, which were their water roads.

EARLY ROMAN CRAFT FROM A PICTURE ON A WALL AT HERCULANEUM.

The Sea Road.

Phœnicia, upon the coast of what is now Palestine, was excellently situated to become the carrier for, and its cities the depots between Arabia, India, Persia and other parts of the trading East on the one hand, and Europe upon the other.

Sidon and Tyre, nearly 700 years before Christ, were the entreports for this trade.

Tyre. The Old Testament prophet described Tyre as a city of unrivaled wealth, "whose merchants were princes, and whose traffickers were the honorable of the earth."

The first great sailors were the Phœnicians, who were able to control the trade of the semi-landlocked Red Sea and Persian Gulf, as well as that of the Mediterranean, thus forming an almost protected waterway well toward the Orient.

The Coaster a Pioneer. Westward the Phœnicians reached out to the Ionian and other islands, into the Aegean, the Adriatic, and North Seas, and northeastward through the Bosphorus to the Black Sea.

In these waters were nurtured the infant shipping and marine commerce of the world, even though the sailor of this period was but a coastwise voyager, a semi-landlubber, who dared not go out of the sight of land, being without the wonderful and mysterious guiding finger of the compass

Herodotus tells us that as early as 604 B. C. a Phœnician fleet cleared from a Red Sea port, and, by hugging the coast, and keeping always to the right, doubled the southern promontory of Africa.

Around Africa in 604 B. C. After three years, the fleet returned to Egypt by the Pillars of Hercules, or Strait of Gibraltar. Unless Herodotus erred, these Phœnicians preceded by almost 2,000 years Vasco da Gama, who rounded Africa sailing in the opposite direction.

The Development of Early Navigation.

The ease with which to-day we cross streams, rivers, bays, lakes, even oceans, has caused us to fail to realize what serious obstacles these presented before the days of bridges, tunnels and vessels ranging from rowboats to ocean steamers.

In the earliest times, man was limited in his travel by the nearest streams. Practically the smallest rivers isolated him as effectively as if he were living on an island in the middle of the [redacted]

Doubtless man's first effort at navigation was when he paddled across a stream on a log.

The Raft. His next step was to fasten several logs side by side, forming a rude raft. Where the logs were not available, bundles of fagots, brushwood or reeds were fastened together.

Next logs were hollowed by burning or charring, and scraping out the burnt portions with shells. Thus was born the dugout, specimens of which, associated with the stone age of man, have been discovered in connection with explorations of the Swiss lake dwellers.

The Canoe. Then man learned to stretch bark or skins over a framework, fashioning thereby a rude canoe. Inflated skins also were sometimes used.

Canoes, or boats, made of pieces of wood fastened together with thongs of vegetable growth, followed as the next step towards the ship. The vessels of planks bolted together with inserted ribs, and decked or half-decked, followed as a logical improvement. Later man learned to set up the framework or ribs first, and nail or pin the planks of the hull to these ribs.

Manual Propulsion. The earliest Egyptian vessels date back to 1000 B. C., and show probably the first application of the oar or power other than the paddle as a means of propulsion. These boats, which might probably be termed the first ships, had as many as 22 rowers on each side, and four or five steersmen.

Early native boat, Sandwich Islands.

The Phœnicians invented the bireme and the trireme, the first having two and the latter three banks of rowers. The trireme became the Greek warship about 700 B. C. This type of craft was developed until it reached the point where it is said there were 16 banks of rowers.

Oars 53 Feet Long.

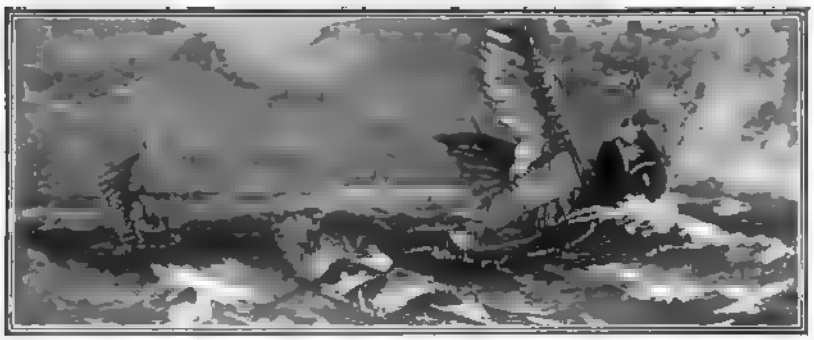
The vertical distance between these banks was two feet, and the horizontal distance between each seat in the same bank was three feet. The longest oars were 53 feet in length. The Attic triremes were 118 feet long, 18 feet wide and 20 feet deep, with a beak or ram 10 feet long.

The Roman vessels had towers fore and aft, from which darts could be showered on the enemy's decks.

Impractical.

The famous Tesseraconteres, or 40-deck vessel, of Ptolemy Philopator, though not of practical use, approached the size of our vessels of to-day, as it was of 11,320 tons. Noah's Ark was still longer and more practical. It is supposed to have been 525 feet long, 87½ feet wide and 52½ feet deep.

We read of vessels with banks of rowers as late as the ninth century A. D.; their oars were even longer than on the ancient vessels.



CHINESE JUNKS AND THE SEA END OF THE GREAT WALL IN THE DISTANCE

The Sailing Vessel.

There were sailing vessels in the latter days of the Phœnician and early days of the Roman empire. Cæsar, in 54 B. C., wrote that the Gallic ships were built of oak and designed to endure the force of tempests. In the beginning sailing ships seem to have had two masts, which later gave way to the single mast. Then again came the two-master, and later the three-masted boat.

The planking of some of these vessels was fastened to the frame on the plan of the staves of a barrel, the whole being held together with eight or ten bands running fore and aft, like hoops.

A Set Back.

The barbarians who invaded the ancient empires of Europe set civilization back many centuries, and the ancient art of shipbuilding, with many other arts of that era, was almost lost. Medieval Europe appears to have

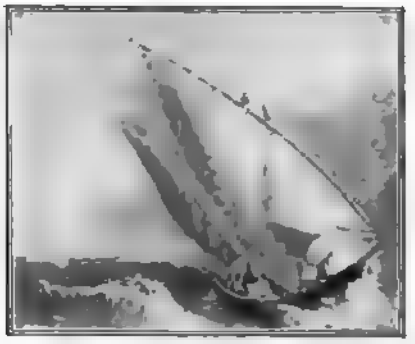
known much less of shipping than the Romans, Phœnicians and other early navigators.

Shipbuilding languished in Europe until the discovery of the compass in the 12th century. It is said, however, that the compass was invented in China by the emperor Hon-aug-ti in 2634 B. C. After it came into use in Europe commerce and shipping leaped forward, and by the middle of the 14th century many sailing vessels were in use.

The Sea of Darkness.

We have elsewhere quoted from an early writer, who called the Atlantic "the sea of darkness." Ibn Khaldun, the Arab, at the close of the fourteenth century, described the Atlantic as "a vast and boundless ocean, into which ships did not dare to venture out of sight of land, for even if the sailors knew the direction of the winds they would not know whither they would carry them, and as there was no inhabited country beyond it, they would run great risks in being lost in the mist and darkness." He further asserted that "the limit of the West was the Atlantic."

This gives an idea of the extent of maritime and geographical knowledge but five centuries ago, respecting the supposed trackless wilderness of waters which surrounded the known parts of the globe.



EARLY MEDITERRANEAN SAILING CRAFT.

Prince Henry, The Navigator.

The first steps on a broad scale toward breaking pathways for marine commerce through the unexplored expanse of the "Sea of Darkness" were taken in 1414 by Prince Henry of Portugal, known as "The Navigator," a grandson of King Edward III. of England.

Prince Henry diligently collected all available information from the ancient geographers. He studied mathematics and astronomy, particularly as they bore upon navigation, and by the offer of princely rewards, secured the co-operation of the boldest, most skillful and daring navigators of the day. He also sent expeditions to chart the West African coast.

A Boiling Ocean.

The earliest mariners imagined that in the region of the equator the waters were so heated by a blazing sun "that the waves beat boiling" on the shores

A VIKING SHIP.

AN EARLY GALLEON.

Each expedition, aided by the charts of its predecessors, pushed farther and farther on, and in 1486 Bartholomew Diaz rounded the Cape of Good Hope and returned. In 1498 Vasco da Gama doubled the Cape. Pushing on, he ploughed a new route to the East Indies and landed on the coast of Malabar.

CHRISTOPHER COLUMBUS.

The Ocean Pathfinder to the New World.

Lisbon a Mecca. The fame of these Portuguese discoveries and expeditions attracted to Lisbon many of the learned, the inquisitive and the adventurous from all parts of the world, among them Christopher Columbus, who came about 1470.

He shortly after married the daughter of Monis de Perestrello, who had been one of the most distinguished cavaliers and voyagers under Prince Henry, and who had colonized the Island of Porto Santo.

Columbus' Opportunity. In Lisbon the couple resided with the mother of the bride, who gave Columbus access to all the papers, charts and journals of his deceased father-in-law.

He thus learned the ocean routes known to the Portuguese, and their geographical surmises and plans. Becoming naturalized, he took part in occasional expeditions to "Gynea," or Guinea.

Columbus a Maker of Maps. On shore he supported his family by making maps and charts. How valuable and costly they were in those days, may be gleaned from the fact that Americus Vespucci paid the equivalent of $555 for a map of sea and land made at Mallorca in 1439, a sum probably equivalent to ten times as much to-day.

The making of maps ranked one among the men of science of that era. Geography was at this time but emerging from the darkness which had enveloped it for ages; Ptolemy was still its standard authority.

Phantom Islands. The early maps, being constructed from imagination and hearsay, and therefore erroneous, had phantom islands upon them, which gave rise at various times to the assertion that America had been known before the now accepted date of its discovery.

Columbus corrected many current errors and notions. He divided the earth into its rotation of 24 hours of 15 degrees each, and measuring from the city of Thinæ to the Canaries, he reckoned that there remained eight hours, 120 degrees, one-third of the earth's circumference, as yet unknown.

To the East via the West. He therefore reasoned that by pursuing a direct course to the West a navigator would arrive at the extremity of Asia, unless intervening land prevented.

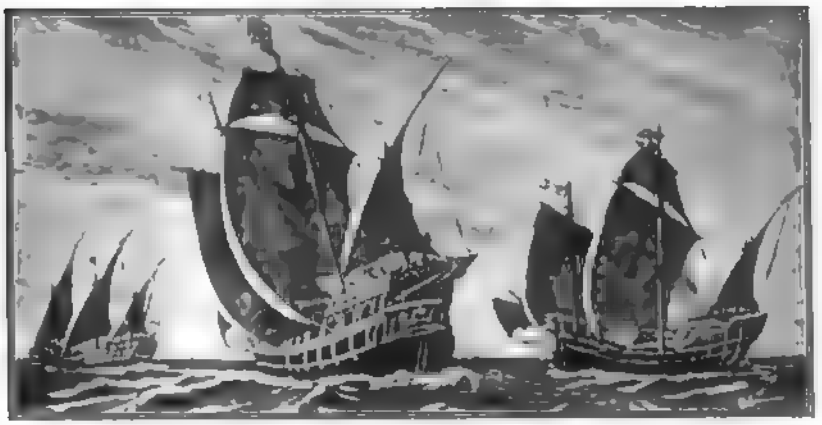
The Research and Theories of Columbus.

Early Evidence. The conviction was strengthened by the hypotheses of Aristotle, Seneca and Pliny. The stories of the extensive and rich islands lying adjacent to Asia, brought back by Marco Polo and John Mandeville, who had visited parts of that continent far beyond the regions laid down by Ptolemy, also influenced him in his belief.

The voyage of Ioao Vaz Corteral, who in 1463 is said to have discovered Newfoundland, Terra de Bacalhars, or the "land of the codfish," further confirmed Columbus in his views.

The discovery of strange wood and of cane, and even of corpses of a strange people washed upon the shores of the Canaries, also sustained his theory.

The Sagas and Lief Ericcson. It is said also that Columbus, on voyages as the master of vessels to Bristol, England, learned from the Arctic whalemen the stories told in the Sagas of the Norsemen of the discovery of Greenland by



THE CARAVELS OF COLUMBUS.

Icelanders in 982 A. D., and of the continent of America by Lief Ericcson, 18 years later.

Plans Rejected. In 1482 or 1483 Columbus laid his idea before King John II. of Portugal. The junta of nautical and scientific men, to whom the plan was referred, rejected it, but the king, taking advantage of the detailed plan he had procured from Columbus, sent a secret expedition, which returned within a few days, declaring there was no land to the West.

Columbus Begs Bread. In 1484 Columbus, then a widower, left Lisbon, taking his child with him. He went to Genoa and Venice, then great seafaring cities, hoping to get his plans accepted and ships furnished him, but was rebuffed at every turn. Disappointed, he turned to Spain, and in Andalusia stopped at the gate of the Franciscan convent, La Rabida, to beg bread and water for his hungry child.

The superior of the convent, Juan Perez de Marchena, was so struck with the views of Columbus that he threw his influence with him and aided him in gaining the ear of the king and queen.

VARIOUS TYPES OF SAILING SHIPS.

Success After Seven Years. Not for seven years, however, did Columbus' persistence bear fruit. He then, through Ferdinand and Isabella, found himself in command of 120 men and three vessels, only one of which had a deck. He was to receive 10 per cent of the produce of the lands he might discover, and was to be high admiral, governor-general and viceroy. He sailed on August 3, 1492, and went to the Canaries, where he refitted. On September 6, 34 days after leaving Spain, he started on the more important part of his trip, consuming 36 days from the Canaries to the Bahama Islands, a total of 70 days all told. This was the discovery of America and the new world.

Jamestown, 1607. Late in 1606—114 years after Columbus began his voyage—three small ships, one a "pinnasse," sailed from London; they were in command of another Christopher—Admiral Christopher Newport. There were 105 colonists in the party; it was five months before they landed on the shores of Virginia and were able to plant a colony at Jamestown. The actual voyage required about three months.

A Voyage in Cockleshells. The trip of these cockleshells was a tempestuous one. For six weeks they were stormbound within sight of England, and for 17 days after reaching Virginia they sailed up and down the rivers searching for a suitable place to land.

An interesting side light on the carrying capacity and luxurious fare and provisions for the pioneers sailing in these early ships is furnished by studying the cargo list of the three vessels.

A Year's Rations. "For each man the ration was 12 bushels of cereal, one gallon of spirits, two of vinegar and one of oil. For meat, the colonist must rely on his gun and the rivers would furnish other food." This was supposed to last for a year from the time of sailing.

In addition, there was "one suit of apparel, three pairs of Irish stockings, four pairs of shoes," and "canvas for a bed," as well as cooking utensils, arms and tools. In 1609, after Captain John Smith had left for England, the settlers at Jamestown went through a "starving time" lasting many months, during which they were obliged to eat rats, snakes, toads and even dead bodies, to prevent starvation, such was the lack of productivity of the undeveloped country as they found it.

YARMOUTH QUAY.

The Half Moon. It was two years later that the Half Moon, commanded by Henry Hudson, an Englishman in the employ of Holland, sailed from Amsterdam in search of the Northwest passage. Hudson explored the Hudson river, thence sailing northward into Hudson Bay, where his crew mutinied and set him adrift in a small, leaky boat. He was never heard of again. The Half Moon occupied 151 days in making the trip from Amsterdam to the mouth of the Hudson river, the present site of New York City.

This tiny craft could carry only 20 persons, and it would re-

quire 395 voyages, extending for over 52 years, for her to have brought the 7,898 passengers who were landed in New York harbor by seven vessels in a single day in 1909. A replica of the Half Moon was brought dry shod to New York from Holland in 1909 on the deck of a moderate sized modern steamship, and took part in the Hudson-Fulton celebration, after which it was anchored in the Hudson River at the foot of the Palisades, past which its predecessor sailed 300 years before.

The Mechanical Propulsion of Ships.

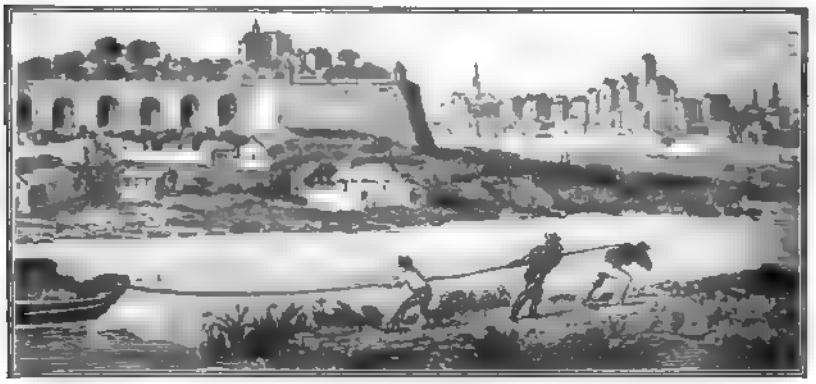
A Prophecy. "And first of all, by the figuration of Arte itself, there may be instruments of navigation as large as ships to brook the sea onely with one man to steere them, which shall sayle more swiftly than if they were full of men." So, at the end of the sixteenth century, wrote Roger Bacon, who undoubtedly foresaw the employment of power which would move vessels more easily and more reliably than "wind or oar."

Men were then already searching for propelling power with these qualities, although in early days many looked upon the attempt to propel vessels by power as sinful, because "it was an insult to Divine Providence" to force a vessel against wind and tide.

Predicts the Submarine. Nevertheless, at about the same time, Swedenborg, the great Swedish scientist and seer, predicted the use of submarine vessels.

In 1578 William Bourne suggested an ox-driven treadmill and paddle-wheel arrangement as a motive power for boats.

But such mechanical propulsion by animals seems to have had a far earlier conception, for Pareerrollus of Padua stated that he had seen an ancient bas-relief representing a boat being propelled by three pair of wheels turned by three pair of oxen Men are said to have furnished the motive power for a similar contrivance even earlier than this. A friend tells the writer that within our own time there was a ferry boat at Albany, N Y., propelled by



TOWING BOATS BY HUMAN POWER IN FRANCE

TOWING ON THE RHINE IN EARLY TIMES. THE RHINE IS TO-DAY PRACTICALLY A GREAT CANAL.

two disconnected paddle wheels, turned by means of mules working on a treadmill. When it was desired to turn the boat, one mule would be stopped and the other vigorously beaten, to increase the rapidity of the revolving of the paddle wheel, thus turning the boat quickly.

Hand Power. At the close of the sixteenth century Thomas Savary, a Cornish mine captain, proposed a crude hand-power engine, similar to a mechanic's jack, to drive paddle wheels consisting of two paddle-like blades.

Sir Walter Raleigh, early in the 17th century, referred to navigation and ships in this language: "Whoever was the inventor of ships, every age has added somewhat to them, and in my time they have been a great deal better. We have now studding sails and the weighing of the anchor with the capstan; we have increased the length of cables to resist the malice of the greatest winds, for it is true that the length of the cable is the life of the ship."

The use of a crank to transmit power from a reciprocating piston to a rotary shaft was patented in 1781 by Steed.

James Watt. Dr. James Watt, in 1778, patented an improved steam engine. In speaking of Watt, Sir Francis Bond Head said that by his succession of inventions and discoveries, he brought the steam engine to such a degree of perfection as to stamp it as one of the most precious gifts ever bequeathed to man. "It serves us at all times and in all places, surpasses all others in its stationary powers, and rises above all others as a locomotive power; it can draw over land 100 wagons, and it manifests the same power on the boundless ocean."

Another writer, in describing Watt, says "that he would appropriately occupy the place of Neptune, with a column of vapor for his trident and a steamship for his throne."

The Steamboat Enters Into the Story of Progress and Prosperity.

Steamboat Patents in 1791. In August, 1791, the United States government issued four patents for steamboats. One of them was to John Fitch, who in 1793 propelled a steam-paddle boat on the Delaware river for thirty miles in thirteen hours. He kept the boat in operation for about three

JAMES RUMSEY'S STEAMBOAT, 1787. FITCH'S STEAMBOAT, 1788.

months, carrying passengers. James Rumsey, of Virginia, is said to have preceded him in the propulsion of a boat by steam. In 1800 Henry Bell petitioned the Lords of the Admiralty, calling their attention to the practicability of steam as a propelling power against wind and tide. "My Lords," however, after careful consideration of this proposition, replied that "it would be of no value in promoting trans-marine navigation."

Bell, in nowise discouraged, made a second appeal, but they replied again that "they had no faith in steam navigation."

Far-Seeing Nelson.

The famous Lord Nelson, a member of the board, seemed to be the only one who recognized the mighty possibilities of steam power in the movement of warships, and during the debate said: "If you do not adopt Mr. Bell's scheme, other nations will, and, in the end, vex every vein of this empire."

A chronicler describes an early steamboat as moving in a uniform and delightfully rapid way, and he says he was amazed to observe how it would outstrip a vessel under full sail. In an advertisement anent the Margery, an early steamer upon the Thames, which was of only 70 tons and had engines of but 14 horse-power, it is spoken of as having "superb accommodations."

Early "Luxuries."

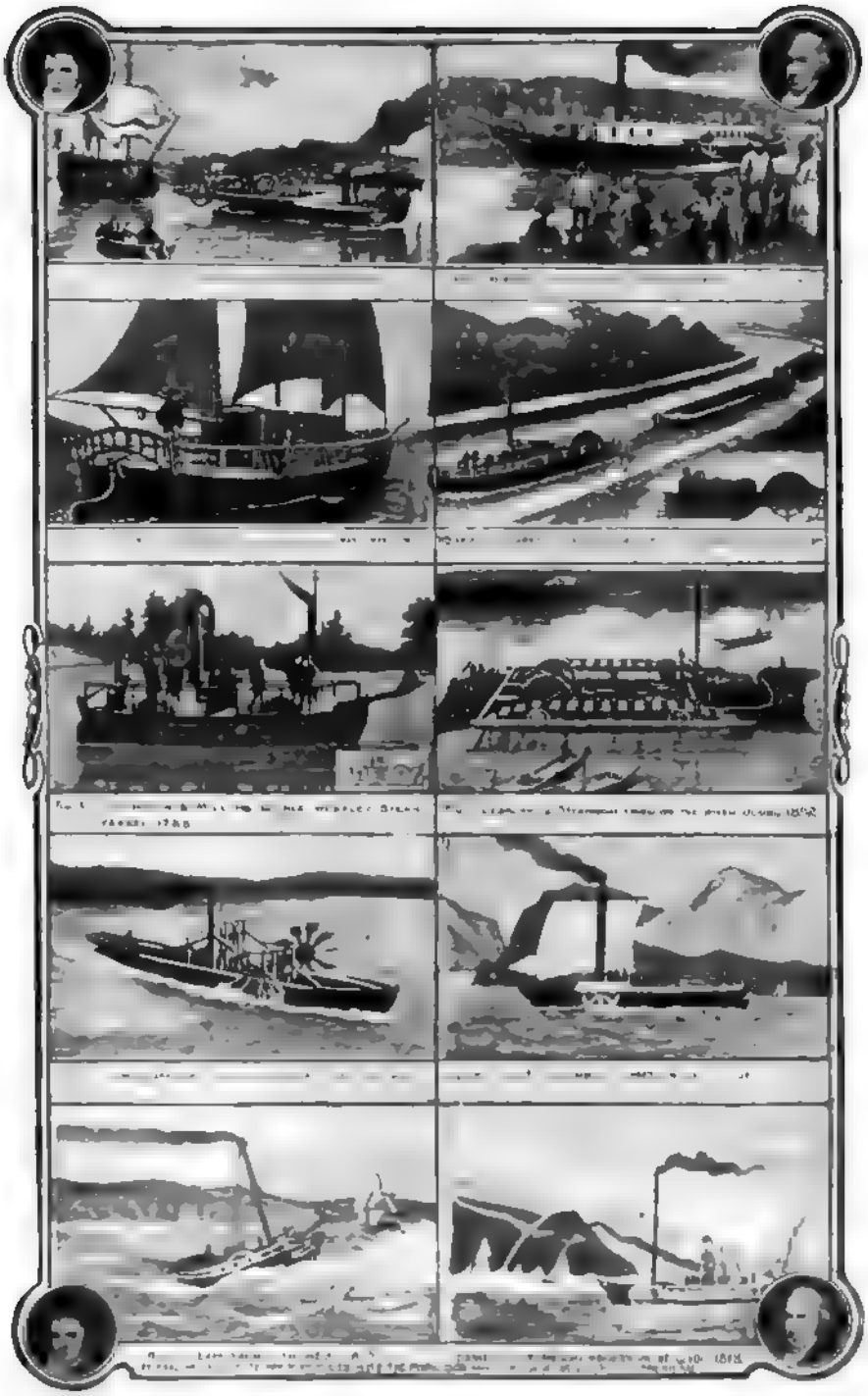
Later, upon another vessel, passengers were informed that "Persons bringing their own provisions will be assisted with boiling water, provided in readiness on board."

Colonel John Stevens, regarded as the pioneer of steam navigation in the open sea, included in his inventions the paddle wheel and the screw driven by a steam engine

America First.

In 1804 he propelled his boat, driven by twin screws, at a speed of six miles an hour across the Hudson river. With his son, he built the Phoenix in 1808 and sent her round by sea from New York to Philadelphia, navigating the Atlantic from Sandy Hook to Cape May, this being the first steamer which successfully rode on the high seas.

MODEL OF FITCH'S STEAMBOAT, 1796. FITCH'S SCREW PROPELLER, 1796.



FULTON'S FIRST STEAMBOAT, 1800. OLIVER EVANS' LAND AND WATER CRAFT, 1804

A Braw Scot as a Pioneer. Scotland claims that in 1801 Patrick Miller, an Edinburgh banker, built a boat with a paddle wheel which was turned by hand. Later Miller is asserted to have equipped the boat with a steam engine. The boat towed two 70-ton sloops 19½ miles in six hours.

Livingston and Roosevelt were also engaged in steam navigation even earlier than Fulton.

In 1807 Robert Fulton started his Clermont on the Hudson river. Her engines were 18 horsepower, with a 24-inch cylinder and four-foot stroke.

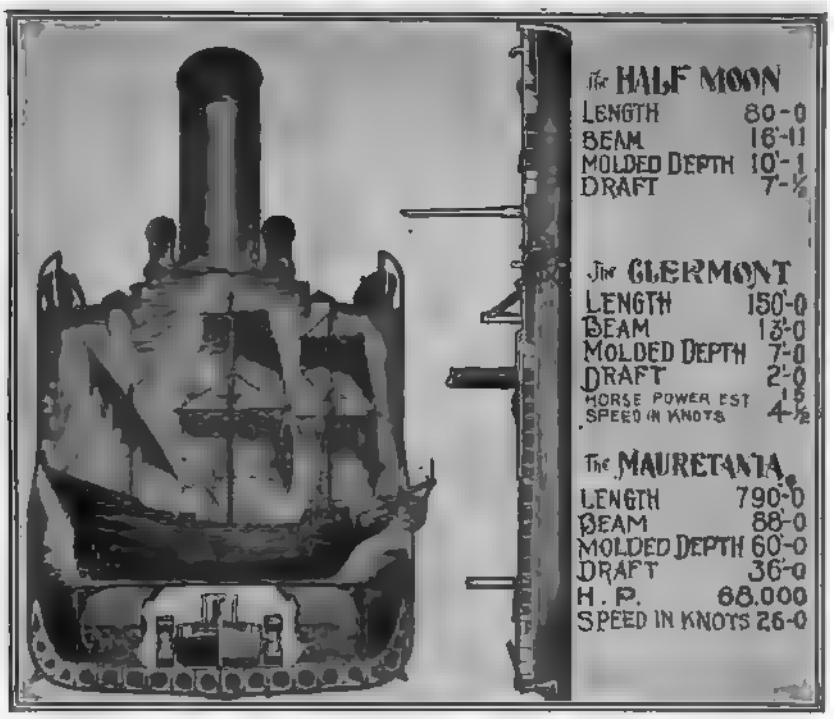
The Clermont. The Clermont was 150 feet long, 13 feet beam, with a depth of 7 feet. How skeptical people were even in that comparatively modern day, we find in the failure predicted for and the jeers which accompanied the starting of his boat. Later she was described as "a monster moving on the waters, defying winds and tides, and breathing flame and smoke."

Dutch farmers living along the banks of the Hudson, when they saw her passing up the river after dark, were so alarmed by the noise of her paddle wheels and the spark of the wood fires issuing from her funnel, that they fled with their families to the adjacent woods, crying: "Der Teufel is coming up the river."

Mauretania and Clermont. It is interesting to compare the Clermont and the modern Mauretania. It would take a fleet of 480 Clermonts to transport as many tons of freight as the Mauretania might hold on a single voyage. The deck alone of the big steamship could accommodate a fleet of some 36 Clermonts, for the former is about six times as long and six times as broad as Fulton's boat.

The Clermont at sea would not exceed two knots an hour—the Mauretania makes 26. The Clermont, if she should carry coal enough and could stand the stress of storm, would make the voyage across the Atlantic in 75 days; the Mauretania's best record is 4 days, 10 hours and 51 minutes.

STEVENS' SCREW STEAMBOAT, 1804. STEVENS' TWIN SCREW STEAMBOAT, 1805.



A COMPARISON OF THE HALF MOON, CLERMONT, AND THE MODERN MAURETANIA. FROM THE *Scientific American*

203 Years. It would require 203 years for the Clermont to bring the 7,898 passengers previously mentioned as having arrived in New York on a single day from Europe. It is of considerable interest that the Half Moon would have transported the same number of people in one-fourth the time, so that in its first stages, the steamboat did not seem to present any practical advantage over its predecessors.

Canada followed on the United States' heels, and began steamer service on the St. Lawrence in 1809.

On the Clyde. The first regular steamer on the Clyde was the "Comet," operated by Bell in 1812. In 1818 a writer, describing an early steam vessel upon the Clyde, says "the smoke of the engine is carried off by a tall cast-iron chimney with the resemblance of a mast, and occasionally serving for a substitute for one, when the wind allowed the sails to be hoisted on it, to advantage."

Over Ocean Pathways. The next forward step was the application of steam to transoceanic navigation. Macdonald, describing Stephenson's work upon the development of steam engines, and their employment for locomotion on land, says "this had much to do with giving impetus to the application of steam upon the ocean Rail Roads."

When transatlantic navigation was first proposed, Dr. Lardner, of London, and many other famous scientists of the time, took up the question and presented many reasons why it could never be successful.

Skeptical. In 1835, the year in which the Sirius and Great Western began regular service from England to New York, Dr. Lardner, in a lecture delivered in Liverpool, said: "As to the project which was announced in the newspapers of making the voyage directly from Liverpool to New York by steam, I have no hesitation in saying that it is perfectly chimerical, and they may as well talk of making a trip from New York or Liverpool to the moon."

Many Objections Urged. Even the Duke of Wellington, with all of his marvelous powers of perception, said in this connection that he would "give no countenance to any scheme which has as its object a change in the established system of the country."

A well-known scientist advanced the theory about the same time that "the prevailing western winds would throw up masses of water, hurled with accelerating momentum over a tumultuous confluence of waters, 3,000 miles in compass, which an immense vessel forcibly impelled by opposing steam power could neither successfully elude nor safely encounter."

THE PHOENIX, 1808 THE CLERMONT, 1807.

The Atlantic Conquered by Steam.

The First Ocean Steamer. To the United States is properly due the credit for the first ocean steamship of the world. The Savannah, of 350 tons burden, crossed the Atlantic fitted with a steam engine and paddle wheels. The vessel was built at Corlear's Hook, New York, and purchased by Scarborough & Isaacs, a shipping firm of Savannah, Ga., who had her fitted with engines so that their city might have the credit of starting the first transatlantic line.

"No Cole to Git Up Steam." Some say the Savannah burned wood, while others speak of 75 tons of coal and 25 tons of wood having been taken on board for fuel. Her log records that on June 18, 1819, when near Cork, Ireland, on her voyage across, which began on May 20 of that year, she "had no cole to git up steam."

THE SAVANNAH, 99 FEET LONG, 1819. THE ARCHIMEDES.

Detachable Paddle Wheels. The paddle wheels of the Savannah were arranged with a series of joints, so that they could be easily detached from the shaft and taken on deck when a storm or other circumstances required this to be done. The shipping or unshipping of the paddle wheels was accomplished in 20 minutes.

The Savannah was but 99 feet long, with a 26-foot beam, and registered 350 tons. It would take a fleet of 108 Savannahs to equal the tonnage of the Olympic or Titanic, now launched for our transatlantic service.

She had 32 staterooms, but, though well advertised, no passenger had the temerity to venture upon her maiden voyage.

Ship Afire! When the Savannah reached the English Channel, she was thought to be a ship on fire, and a British revenue cutter, the Kite, started to give her assistance, afterwards reporting that "this strange ship went faster with bare poles than we could do with all sail set."

This epoch marking voyage was accomplished in 29 days and 11 hours from Savannah to Liverpool. During the 25 days she remained at Liverpool she was carefully and jealously watched by the authorities.

To Rescue Napoleon. It had been rumored that Jerome Bonaparte had offered a large reward for the rescue of his brother, Napoleon, from St. Helena, and the Savannah was suspected of having such an object in view. She later went to Hamburg, to Norway, to Sweden, and to St. Petersburg, frequently entertaining royalty and exciting the wonder and astonishment of all who saw her.

Few inventions of any age have played a more important part in man's progress and prosperity than steam applied to the carrying of man and his produce. This little vessel, which would to-day be called a steamship only out of courtesy, was the forerunner of a mighty factor in commerce.

Differences in Ocean Travel!

It was something worth talking and boasting about to make an Atlantic voyage in those days. There were fixed days for sailing, but none for arrivals; the sailing ship from across the ocean might reach New York or Halifax in three weeks or it might be seven

weeks, according to the wind and weather encountered on the voyage.

First-Class or Steerage?

It is said, and doubtless it is true, that the first-class fare and accommodations upon these Atlantic voyages would not be offered to even steerage passengers upon a modern steamship.

That ship's biscuit, or hard tack, wore out the teeth, and that it was necessary to knock the weevils and worms out of it before dining, were not marine jokes in those days. For many years it was not believed that risen bread could be made upon the sea.

Floating Pest Houses.

The early steerage passengers provided themselves in advance with food for the voyage, though often from head winds and increased length of the trip, there was great suffering from lack of nourishment. Many ships became floating pest houses, a large proportion of the passengers falling victims to typhus fever, smallpox, or other diseases incident to overcrowding and the stifling atmosphere, particularly when hatches were battened down in bad weather.

The Royal William.

A Canadian steamer, Royal William, crossed the Atlantic in 1835, and immediately Dr. Junius Smith, an American residing in London, urged business men and bankers to interest themselves in steam power for vessels. After much ridicule, he promoted the building of the British Queen. A rival company was organized shortly afterwards.

The First Regular Liner.

Delays of contractors and changes in construction of the British Queen brought about the leasing of the steamer Sirius, which had already been used between London and Cork. The latter sailed just in time to save the company's prestige, as the Great Western, the rival company's boat, followed her across a few days later.

The Iron Ship.

The Victorian iron ship and screw-propelling period was inaugurated in 1847, when the Great Britain was launched at Bristol, England, for the American trade. The Great Eastern followed in 1852; she was

Early Boston Harbor.

sometimes called the Eighth Wonder of the World, creating the sensation of her time and is famous in shipping annals to this day.

Enter the Screw Propeller.

The screw propeller was experimented with jointly by Petit Smith, an English farmer, and Captain John Ericsson, a Swedish-American. The latter, in 1836, secured the first patent. His propeller consisted of two thin hoops on short cylinders revolving in contrary directions around a common center.

Captain Stockton, of the United States Navy, saw Ericcson's patent and ordered two boats from him. One, the Robert Stockton, crossed the Atlantic in July, 1838, and was later sold to the Delaware and Raritan Canal Company for use as a tug boat.

The United States government fitted up the Princeton on Ericcson's plans. In 1843 the French installed the screw propeller Archimedes.

THE PRINCE ALBERT, 1850

Early Queens of the Sea and Rivalries.

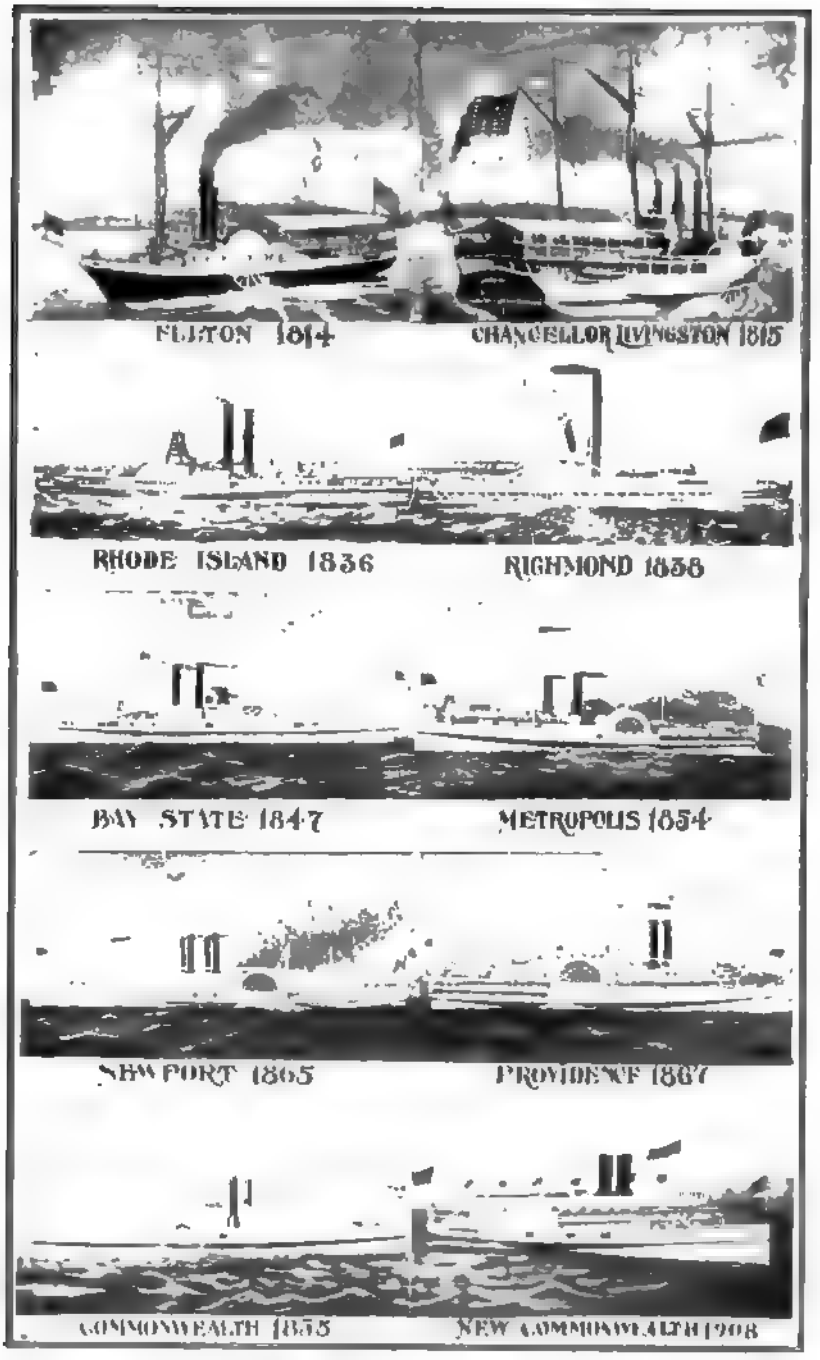
Americans Wake Up.

In 1847, seeing their most valuable maritime commerce passing to the new British transatlantic steamers, an American line was established from New York to Southampton. Their first ship, the Washington, started on the same day as the Britannia, which won this initial race between American and British steamers by two full days.

America, however, turned the tables when E. K. Collins, of New York, in 1850, established a line with the intention of outrivaling the Cunard Line. His steamers, the Arctic, Baltic, Atlantic and Pacific, were built with government aid, and made better time than the British boats. The line, however, met with a series of disasters and the company collapsed.

To India.

"Ocean Rail Way" communication with the Far East was the next problem. The route from the Mediterranean across the Isthmus of Suez and through the Red Sea to India is older than the days in which the Queen of Sheba visited Solomon. But cheap transportation did not


FULTON 1814
CHANCELLOR LIVINGSTON 1815
RHODE ISLAND 1836
RICHMOND 1838
BAY STATE 1847
METROPOLIS 1854
NEWPORT 1865
PROVIDENCE 1867
COMMONWEALTH 1855
NEW COMMONWEALTH 1908

come until the ocean Rail Way enabled direct communication by water through the Mediterranean, Suez Canal, Red Sea and Indian Ocean.

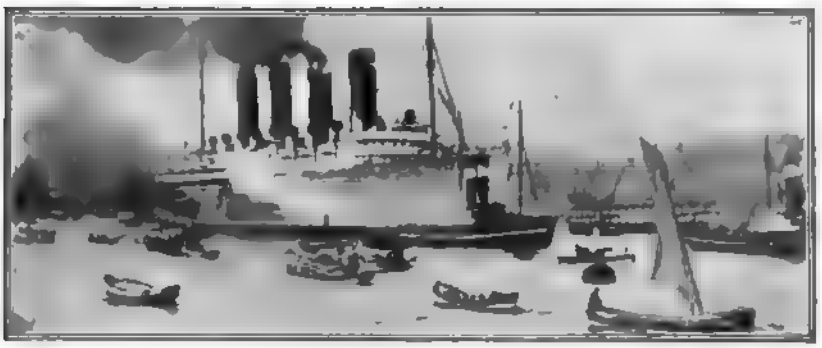
The steamship was early described as "the infant Hercules now reaching maturity," and of the lines of steamers to India it was said they "ran as regularly as a steam coach on a Rail Way." The first steam vessel to make the voyage to Calcutta was the Enterprise, which, in 1825, completed the trip in 113 days. Strange as it may seem, the East India Company at first declined to sail any steamships on its lines to the Far East. In those days it cost £300, or $1,500, for passage from Calcutta to London.

Ocean Racers. The first regular line of iron screw steamers between Europe and America was the International or Inman Line, named after its founder. In August, 1869, the City of Paris, of this line, crossed from Queenstown to Halifax in 6 days, 19 hours.

The City of Brussels then made a record of 7 days and 23 hours between New York and Queenstown.

Early Rivals. Public attention now became interested in the race between the rival ocean Rail Way companies, for as soon as one line established a "Flying Scotsman," another started a "Flying Dutchman" to beat it.

The America, built in 1883, made a record of 6 days, 14 hours, 18 minutes. Hours and minutes have been clipped since from time to time, and the less than 4½-day record of the Mauretania, made in 1909, is probably but a step toward a still faster steamer. A round trip between Liverpool and New York was made in 1910 by this steamship in twelve days, including the time for discharging and loading at New York.



THE MAURETANIA, 1910

The Ocean Rail Way of To-day and Yesterday.

A Far Cry. Many changes have come about since the 70-day passage of Columbus across the Atlantic to the Bahamas, the 139-day passage of Henry Hudson from Amsterdam to New York, John Smith's 150 days to Jamestown, or the 63-day voyage of the Pilgrim Fathers in the Mayflower

in their attempt to reach the Hudson, though they landed at Plymouth, Mass.

To-day our Lusitania and Mauretania make their trips over the ocean highway so that one may breakfast in New York on Wednesday morning and in London upon the following Monday, or in Paris on Tuesday, and with such regularity that persons make engagements according to the ships' schedules. Reversing the voyage, one may lunch in London on Saturday and dine in New York on Thursday night; or dine in Berlin, and on the seventh day in New York.

A Quadri-City Union.

Ocean transportation of this character is surely bringing these four great world cities and the nations which they represent, into close touch one with the other. It is the motto of the day that time is money, and this marvelous saving of time represents a tremendous advantage to the business man and man of affairs on both sides of the water.

The hardships and privation of the Mayflower compared with the luxury of ocean travel to-day represent extraordinary anomalies.

The evolution from the conditions which we recited as belonging to the early sailing days, was comparatively slow.

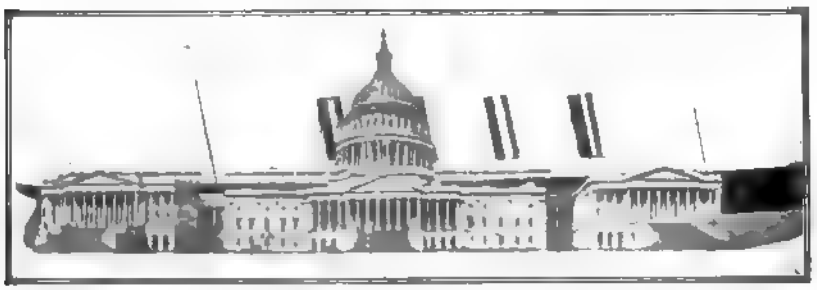
Sleeping in Bunks.

A gentleman recently recited his experiences on a voyage in 1859. The berths, in those days called "bunks," were such in fact as well as name.

During this voyage the passengers' mattresses and bed linen were washed in salt water every two weeks, and the bill of fare consisted of a procession of pork and beans one day, salt fish the next, and salt horse on the third. And then came a renewal of the procession over the same ground, with two gala days each week on which there was served, as a great luxury, plum duff or suet pudding.

Candle Light; No Heat.

Another friend of the writer describes the voyage in one of the middle-period transatlantic liners. She was considered most luxurious in her time, although the "grand salon" was lighted by only a half dozen candles; the ship was unheated, and the only way of keeping warm in cold weather was either to stay in one's berth or to hug the smoke-stack where it passed through the cabin.



THE MAURETANIA COMPARED WITH THE NATIONAL CAPITOL.

THE OLYMPIC, 882 FEET LONG, 1911

Rivals of Noah and Lucullus.

A Riot of Luxury.

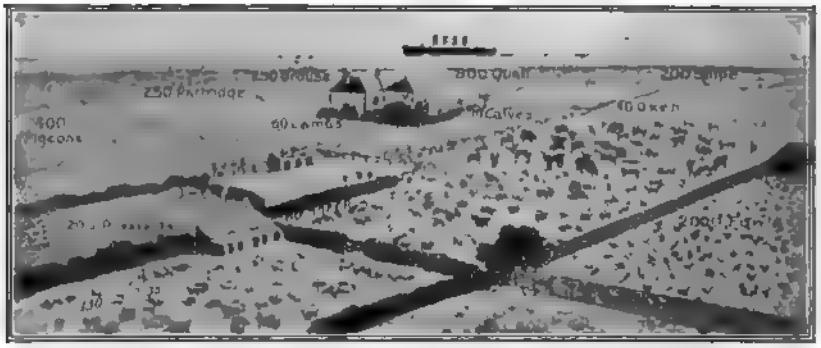
To-day luxury runs riot, and the choicest viands of land and sea are at the disposal of the ocean traveler. While in the olden days it was not uncommon for the ocean voyager to get the scurvy, he is now more in danger of getting the gout.

Floating Hotels.

Our modern transatlantic liners can properly be ranked in their accommodations and cuisine with the most magnificent modern hotels. A brief description of the provisioning of one of these ships sounds almost like a page from the supercargo's record of Noah's ark.

For a single trip of a modern transatlantic liner between New York and Liverpool, the following animals, birds and fowls were put into her larder: 40 oxen, 130 pigs, 80 sheep, 60 lambs, 10 calves, 150 turkeys, 90 geese, 350 ducks, 250 pheasants, 250 partridges, 250 grouse, 200 snipe, 800 quail, 400 pigeons, and 2,000 other fowls. There were 20 kegs of oysters, 10 boxes of fresh herring, three-quarters of a ton of salmon, 12 barrels of red herrings, 36 boxes of bloaters, 84 boxes of haddock, a ton and a half of ling, 45 boxes of Turbot sole and fresh fish, mackerel, kippered herring, turtle, with crabs, lobsters and other sea food thrown in.

More Menu Material.



LIVE STOCK REQUIRED TO PROVISION THE LUSITANIA FOR ONE TRIP.

To prepare these there were 50 cooks, while 350 stewards and waiters served the food.

Coal Consumers.

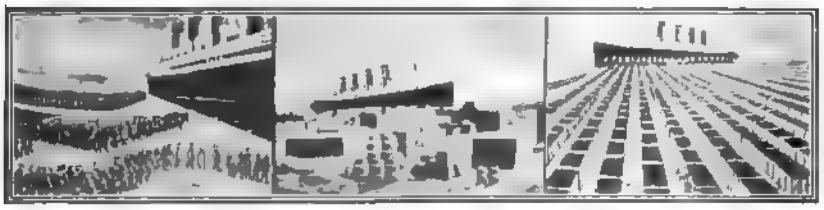
But the food for passengers and crew is not all that these great modern steamships consume, for they have most respectable appetites of their own. One of the modern ocean racers requires in coal 22 English trains, of 30 cars to the train, each car containing 10 tons, to satisfy the fiery appetite of her voracious furnaces on a single trip across the Atlantic.

We give a number of pictures showing the size of the great modern steamships as compared with familiar objects.

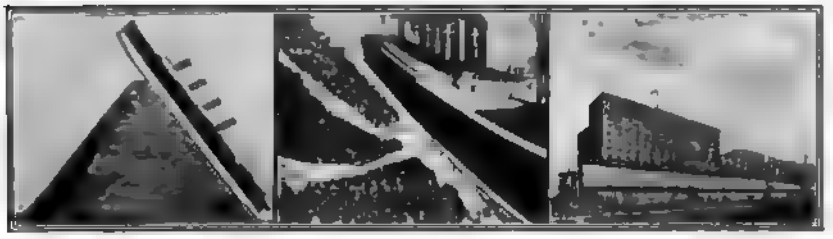
These ocean mastodons have reached the length of 790 feet, or are little less than one seventh of a mile in length, and have a breadth of 88 feet, considerably wider than the average street from building line to building line. They have a depth of 80 feet. The Olympic, of the White Star Line, in course of construction, is to be 882½ feet long. The tonnage of this vessel, it is claimed by the White Star Line, far exceeds that of the combined fleets engaged in the Spanish armada conflict. The Cunard Line is understood to plan a vessel a third larger than even the Mauretania or Lusitania. It is to have a displacement of 60,000 tons, and is to be 885 feet long, while the Europa, of the Hamburg-American Line, is to be 900 feet long and of 61,000 tons.

A Floating House.

The Mauretania has eight decks. She is really a great ocean hotel eight stories high, drawing more than enough water—37½ feet -to submerge the average three-story house She has a displacement



THE CREW OF THE MAURETANIA NUMBERS 900. SEAFOOD FOR THE TRIP COAL REQUIRED 22 ENGLISH TRAINLOADS.



THE MAURETANIA AND THE GREAT PYRAMID. THE MAURETANIA ACCOMMODATES 2,300 PASSENGERS. THE MAURETANIA AND THE AUDITORIUM, CHICAGO.

of 45,000 tons, or we might say that if she were devoted to freight carrying, 40,000 average wagon loads of material might be dumped into her.

The height of the top of the Mauretania's funnel, 155 feet, is greater than the length of the Clermont, and exceeds that of the average flag-pole, while the top of the mast-head, 216 feet, is as high as some of our tallest church spires.

Such a ship afloat is a little city in herself, with her crew of 800 to 900, and accommodations for 2,300 passengers, or 3,200 souls all told. The newest German steamship, the Europa, is to carry a total of 5,000 people.

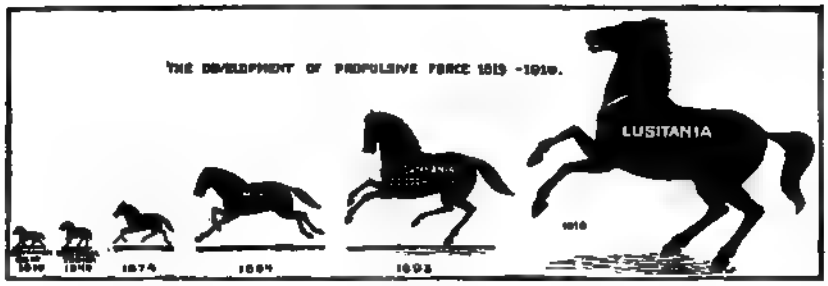
Horse Power.

Muscle and Speed.

Perhaps one of the most marvelous things about these modern Titans is the power it takes to force them through the water. Most of us have rowed boats or paddled canoes, and are familiar with the amount of muscle it takes to obtain even a very modest speed; then imagine that you take a string of houses one-seventh of a mile long, three stories high and 88 feet from front to back, loaded so as to submerge them to their roof-trees.

Then apply force enough to pull them through the water at the rate of a mile every two minutes, and you get an adequate idea of the seemingly almost irresistible force that must be exerted by the machinery of the modern steamship.

THE LUSITANIA AND THE MAURETANIA WOULD CLOSE THE EAST RIVER



THE MARVELOUS INCREASE OF HORSEPOWER IN STEAMSHIPS, 1819-1910.

From Savannah to Mauretania.

The 700-ton Sirius had a horse power of only 270; the modern ocean racer has the horse power of 250 such vessels. Steam was first applied to the paddle wheel; this later gave way to the single screw propeller. In cases of accident it often was found that steamships practically became helpless if they broke this propeller shaft. Therefore, the power was divided, and twin screws came into vogue; then came triple screws, and now four propellers, or four units, are used to apply the force and kick from turbine engines of a combined strength of 68,000 horses against the water.

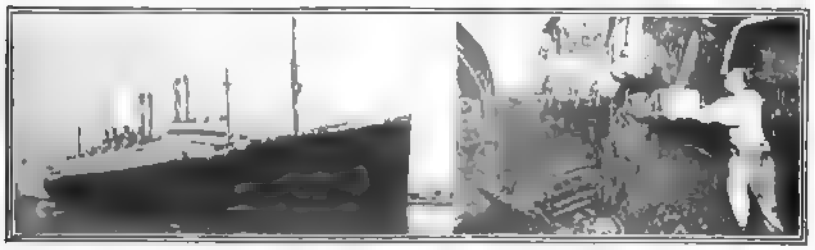
What "Horse Power" Is.

A "horse power," it may be mentioned here, is the measure of a steam engine's power, being, as originally settled by James Watt, the lifting power necessary to raise 33,000 pounds to a height of one foot in one minute; 68,000 horse power, therefore, would raise 2,244,000,000 pounds, 1,122,000 tons, to a height of one foot every minute.

To give some little idea of the work done by an engine of this strength, let the reader consider that 68,000 horses placed head to tail, in a single line, would extend from New York to beyond Providence, R. I., or from London to the Isle of Wight, while, if they were harnessed in a great team, eight abreast, there would be no fewer than 8,500 rows of powerful horses.

Express Speed.

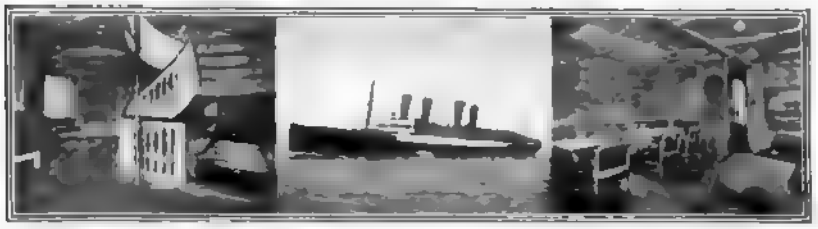
Not only has the power gauged by the number of horses been greatly increased, but the modern ocean racer has accelerated its speed from the mod-



THE S S GEORGE WASHINGTON IN THE SLIP [illegible]

cst two knots an hour of its earliest prototype to nearly 26 knots, or 29.9 miles an hour, an increase of 24 knots, or 27.6 miles, an hour. The term "express steamer" is no courtesy, but the most substantial fact indeed.

Nothing Lacking. The conveniences of the modern steamship seem to include all one can desire. There are decks and promenades of three laps to the mile, while the companion way has been replaced, first, by the grand staircase, as sumptuous almost as in some great opera house, and this in turn by the modern elevator or lift.



ENTRANCE HALL. S. S. DEUTSCHLAND. SMOKING ROOM

Art in Furnishings. The ceilings in some of our modern ocean dining salons are 28 feet high; royal palaces have been ransacked, chateaux have been deprived of treasures, interiors of castles copied, and the artistic ideas of the periods of the Louis have been almost exhausted as models for the public and private rooms.

State rooms and suites of rooms, tiled baths, swimming pools, and gymnasiums in which one may take a horseback ride upon a tireless mechanical beast that will change gait and go as long and as far and jolt you as hard as you choose to indicate by pushing the button, are at the passengers' disposal.

The Charms of Music. There is a band and an orchestra; there is the solarium; there is the lounge, the smoking room, the ladies' afternoon tea room, the drawing room, the telephone exchange connecting every room in the ship, the tavern or rathskeller with its portico, electric lighted, steam heated, mechanically ventilated, sanitary lavatories, bath rooms and showers, with hot and cold fresh and salt water, and electric light baths

The daily newspaper or magazine with a summary of the news of the world, as received by wireless telegraph, is among the many comforts and wonders of such a trip.

Always Available. If one is so unfortunate as the traveler who was found wan and pale in the near vicinity of the rail by a fellow passenger, who asked, "Have you dined?" and received the reply, "No, the reverse," he or she could make up the loss at practically any time of the day or night, as the kitchen and dining room of the modern liner are available at almost all hours.

STAIRWAY AND ELEVATOR. S. S. KAISERIN AUGUSTE VICTORIA. DINING SALON.

The Safety of the Modern Steamship.

But it is not alone in luxury, speed and comfort that the modern ocean Rail Way liner is bountifully supplied, but in that greatest of all assurances to the timid—appliances for safeguarding the vessel and its contents.

Water-Tight Compartments. The old-time vessel had a single compartment as a hull, and if it sprung a leak at any point or was run into, her doom and sometimes that of all her passengers, was sealed. The modern steamship hull is divided into compartments, sometimes as many as 175, any one or several of which might completely fill with water without endangering the safety of the vessel.

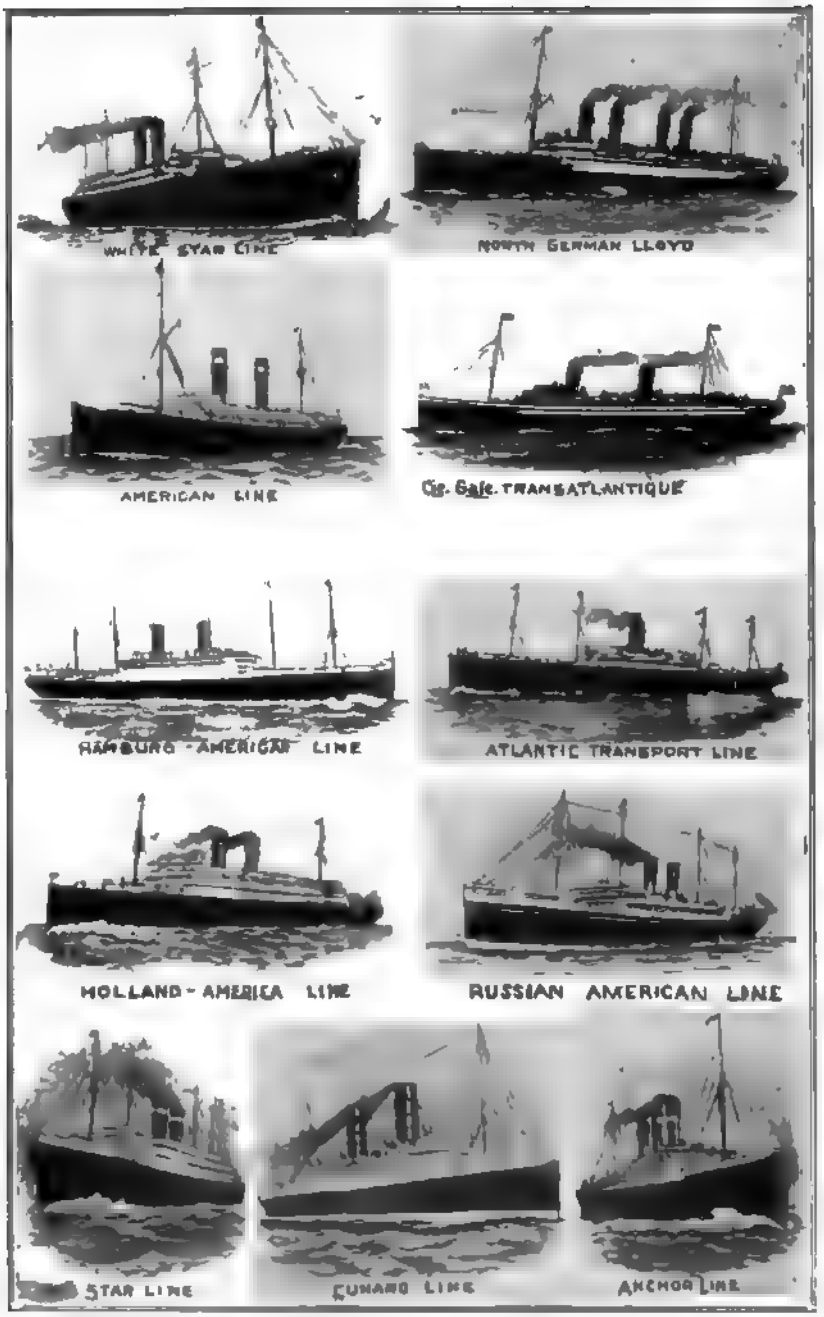
A hole 15 or 20 feet square might be torn in the side of the modern ship and cause little more than inconvenience. As an additional precaution, the vessels have double bottoms and sides.

The captain on the bridge of the modern liner can instantly close the compartment doors, or bulkheads, and defy the inroads of Neptune. Davy Jones' locker is bare indeed of bones lost in modern ocean craft at sea.

By Wireless, "C. Q. D." The submarine bell and telephone, that in foggy weather enable vessels to ascertain with certainty whether or not they are near shore, or near other ships, and the wonderful wireless telegraph, are other items that contribute to make ocean travel safe. The signals to the engine room are reproduced on a dial in the pilot house, so that mistakes in signals are noticed immediately they have been made, the danger therefrom being thus reduced to a minimum.

The cost of accommodations on the modern steamship or transatlantic liner is both within and beyond the reach of most. One may travel across the ocean in the steerage for a cent a mile, or substantially $28, including meals: in the second cabin one may go for from $40 to $70, or from one and one-half to two cents a mile, and in the first cabin from $72.50 up, according to the vessel, a minimum of less than three cents a mile. The average first cabin fare paid, however, is considerably higher.

$3,000 for Passage. Travelers can pay as much more as they like for their steamer accommodations, and will have no trouble whatever in finding a cabin or suite for which $1,000 is charged for a four days' and a half trip. For other suites one may pay as high as $3,000.


WHITE STAR LINE
NORTH GERMAN LLOYD
AMERICAN LINE
Cie. Gale. TRANSATLANTIQUE
HAMBURG-AMERICAN LINE
ATLANTIC TRANSPORT LINE
HOLLAND-AMERICA LINE
RUSSIAN AMERICAN LINE
STAR LINE
CUNARD LINE
ANCHOR LINE

The Great Service of the Ocean Rail Way.

Famous Steamships.

It is true their magnificent passenger accommodations have given fame to such ships as the Campania, Caronia, Carmania, Mauretania and Lusitania of the Cunard Line; the Kaiser Wilhelm der Grosse, Prinz Friedrich Wilhelm, Kronprinzessin Cecilie, Kaiser Wilhelm II. and the George Washington, these floating palaces of the North German Lloyd; to the giant leaders of the Hamburg-American fleet, the Kaiserin Auguste Victoria, President Lincoln, President Grant, Pennsylvania, Cleveland, Cincinnati, Deutschland and Amerika; to the International Mercantile Marine's superb Adriatic, Baltic, Cedric, Oceanic, Arabic, St. Louis, St. Paul, Philadelphia, New York, Lapland, Finland, Vaderland and Kroonland, and the Compagnie Generale Transatlantique's splendid La Provence, La Bretagne, La Lorraine and La Savoie.

Most Important.

With all this, the freight trains of the ocean Rail Roads mean most to us, and the slower liners particularly have vast cargo capacity. Some of the lines—such as the White Star Line—maintain large vessels as cargo boats exclusively.

Thirty to 35 years ago, steamers were called on to transport only a small percentage of the freight carried over the ocean, sailing vessels taking the major part of the freight. The steamers were built to carry a maximum of from 1,000 to 2,000 tons of freight. To-day the fast freight steamers, crossing the ocean in from nine to ten days, have a cargo capacity of as much as 10,000 tons.

Hundreds of Carloads.

The Pennsylvania of the Hamburg-American Line, a 13,000-ton combination freight and passenger steamer, has carried on one trip between New York and Hamburg more freight than the entire sailing force of this line carried in a year in 1847, when its biggest vessel was the 717-ton, square-rigged, three-masted sailing vessel Deutschland. The displacement of the ships sailing under this house-flag now exceeds a million tons.

The Pennsylvania's hold can take care of a cargo sufficient to load to capacity 616 large American freight cars.

The Tramp of the Sea.

Besides the regular ocean Rail Road liners are the almost numberless tramp steamships which carry only freight, but whose cargoes in tonnage and value aggregate vast totals in the course of a year.

It is to be regretted that the hundreds of vessels which sail into or from our ports, embracing the largest, most sumptuous and speediest freight and passenger carriers in the world, occupying to the ocean Rail Way of the world the same momentous and premier position which our land Rail Roads occupy to the world's land Rail Ways, should, almost without exception, fly the flags of other nations.

TOWING BY ELECTRIC POWER, GERMANY

A FIVE-MASTED AUXILIARY FREIGHTER.

Old Glory Absent.

It is our proud boast that Old Glory goes everywhere; but it is regrettable that it is found on few of our modern flyers, or even on the average tramp steamer or third-class freighter.

In fact, it may be stated that there are only fourteen regular freight and passenger steamships engaged in international trade, flying the American flag—four on the Atlantic, six on the Pacific and four to Venezuela.

The Tonnage of Yesterday and of To-day.

Continent to Continent.

Such has been the development of transportation that to-day the farmer, merchant or manufacturer in the interior of our continent may ship his wares or produce from his own door to the door of his customer or agent in the interior of another continent, on a through bill of lading, with definite knowledge of the cost of transportation and the assurance that without being followed or superintended by himself or an agent, the goods will pass promptly from car to ocean steamer and from ocean steamer to Rail Way car on the other side of the water.

This development is mainly of the last few years, within the memory of thousands. To-day there are 600,000 line miles of Rail Road and on the ocean 5,199,747 net tons of sail-carrying power and 22,140,000 net tons of steam tonnage, the total gross tonnage exceeding 40,000,000 tons.

What "Tonnage" Is.

It may not be amiss to explain that by a net ton is meant 100 cubic feet of carrying capacity after deducting the space occupied by cabins, machinery, etc., while gross tonnage refers to the total before deducting space so occupied. Displacement is the number of tons of water displaced by the vessel at maximum draft.

At the beginning of the last century there were 4,000,000 tons of sailing vessels on the sea. Hence the original has been added once every ten years, a mute evidence of growth and prosperity.

By the middle of that century there were more than 11,000,000 tons of sail tonnage, but less than 1,000,000 tons of steam power.

The land Rail Ways then totaled but 24,000 line miles. Steam power rapidly displaced sail after 1880.

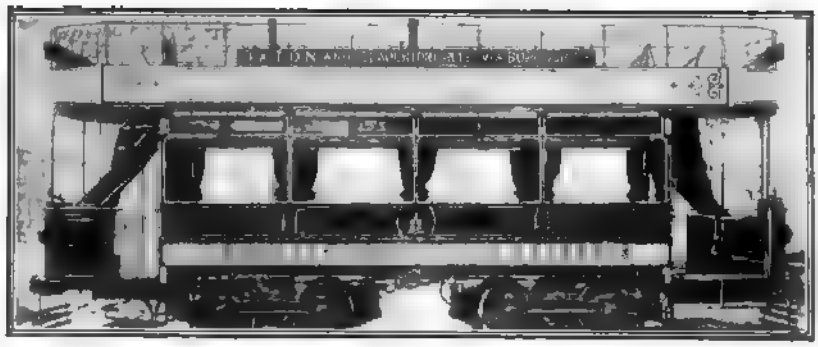
The Results. The wonderful effect on commerce of improved land and water transportation may be grasped when we realize that from a value of 1,500 millions of dollars in 1800, the world's international commerce has grown to more than twenty-eight billions, the growth being nineteen-fold during a period when population increased only two and a half fold.

Stated another way, the world's international commerce has grown from $2.50 per capita in 1800 to about $20 per capita to-day.

A Half Century Ago. The United States in 1855 had 2,348,358 tons engaged in the foreign trade and 2,543,255 tons in the coastwise trade. Of the total, 770,285 tons was steam power. To-day in the foreign trade we have only 930,413 tons, of which 595,147 tons is steam. The aggregate tonnage has grown from 5,212,001 tons in 1855 to 7,365,445 tons to-day.

This, 17 per cent of the world's total of 40,922,842 tons, painfully reverses our premier position in land carriage, and pitifully compares with Great Britain's 18,709,537 tons.

MALAY CANOE WITH OUTRIGGER.



A GLASGOW DOUBLE-DECKER STREET CAR.

SECTION XXVII.

CONTRIBUTIONS TO PROGRESS AND PROSPERITY BY OTHER MODES OF MOVEMENT.

The Assistants. In tracing progress and prosperity, we have found that their existence to-day depends upon transportation and intercommunication. Therefore, a word should be included on other means of transportation which are contributors to our comfort and convenience, as well as of great practical value.

The Street Car and Its Functions.

An invaluable adjunct to city life, and to the growth, progress and prosperity of such communities, was originated by the English and called by them the "tram." In the development and use of this means of locomotion, however, England is now far behind America. They still depend largely upon the cab, with its shilling fare, and upon the 'bus, many of both, however, now operated by motors.

A Need Filled. America, ceaselessly energetic, always hustling, constantly planning and progressing, requires cheaper transit and higher speed than are afforded by the old time cab and 'bus, and the only way to obtain them is by

means of vehicles that run frequently, carrying greater loads or greater numbers of people than either of the former, and thus enabling a lower charge.

As a consequence, Americans have developed the street car service to a highly perfected degree, and are utilizing it to a greater extent than any nation upon the face of the earth. It has become a necessity and prime factor in our daily means of getting about.

New York the Pioneer.

The first American street car was introduced in New York in 1832, which city to-day has 1,500 miles of street car track, enough to reach half way across the continent. In that year the New York and Harlem Rail Road Company, having laid a portion of its tracks, placed in operation a horse-drawn car, consisting of three compartments, each holding 10 passengers, entrance being had through three doors in each side

EARLY STREET CAR, NEW ORLEANS. A RELIC OF FORMER DAYS.

Seats for 30 were on the roof, which could be reached by steps at the end. The roof arrangement was disadvantageous, as much time was consumed in letting passengers on and off. "A much quicker, though otherwise undesirable, mode of egress, was afforded by the frequently occurring breaking down of the roof."

The Service.

From this humble beginning grew the 40,427 track miles of electric street car rails, surface, sub-surface and elevated, in the United States on January 1, 1909, which, with the equipment of 89,216 cars, represented a total capital liability, omitting duplications, of $4,557,136,143 for the 1,252 companies engaged in the business.

The capital is equal to more than one-third of the capital invested in the nation's steam Rail Roads, which do a vast freight business as well as rendering passenger service, and although the street Rail Ways have a mileage only one-eighth that of the Steam Ways. The mileage of street Rail Ways is sufficient to girdle the earth twice at the latitude of New York.

The Hay Burner.

The first motive power applied to street cars was the horse, giving rise to the earlier name "horse cars," professionally known as the "hay burner." Since then, the street car horse has formed the lowest strata of equine society, though now rapidly becoming extinct. In the South, many of these cars were drawn by the patient mule,

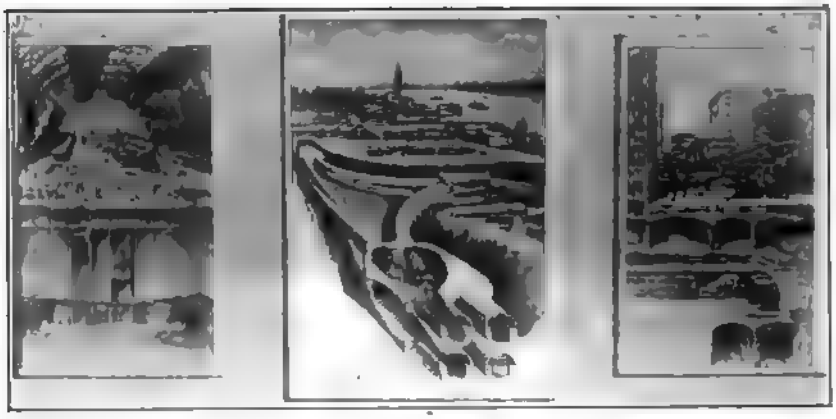
of which it is said that it "has neither pride of ancestry nor hope of posterity."

The successor to the horse in some of the larger cities was the cable Rail Road, which for a number of years represented the highest type of street Rail Way propulsion. There are still 240 miles of this in operation.

When electric power was developed and perfected, the overhead trolley, the underground wire, the third rail and the storage battery system of carrying the current, rapidly took the place of the horse, mule and cable.

Unusual Motive Powers.

Among the many means tried in searching for a cheap power were compressed air at a high pressure and carbonic acid gas; the writer remembers having ridden across New York City in a car successfully propelled by ammonia gas.



A Subway Elevator. Subway Tubes. Subways and Elevateds.

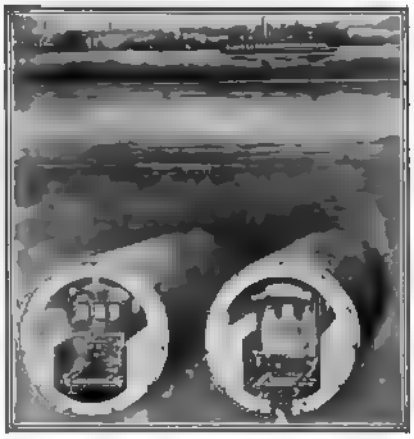
Steam was never used to any great extent, although in Germany street Rail Roads so operated were a familiar sight a few years ago, 'buses of the kind used in Glasgow being attached to the engine. There are only about 175 miles of steam-operated street Rail Ways in the United States to-day.

The street car systems of our great cities carry approximately 5,000,000,000 passengers annually, six times as many as the Rail Roads, although the average Rail Road journey is much longer than the street car ride.

The Elevated.

As our cities expanded, distances to be covered grew and time became more precious, we put our tracks up in the air to avoid other traffic and street crossings, thus creating "rapid transit," by means of elevated Rail Roads. But these also became overcrowded, and so we have begun to burrow into the earth and under the streets with our subways. These last are but in their infancy. London led with her "underground." Paris followed, and America, in a number of places, has begun to adopt this latest method of cheating time.

OVER THE RIVER, FULTON FERRY, 1746.



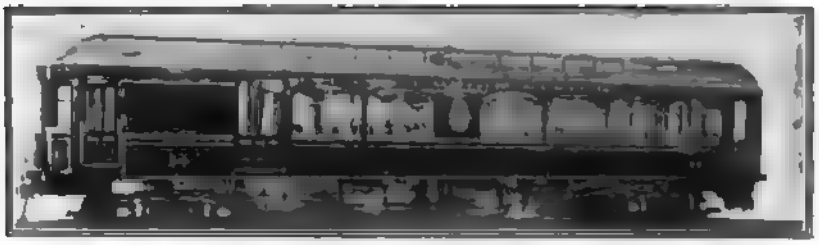
UNDER THE RIVER, 1910.

The Subway. New York City's subway carries 268,000,000 and her elevated systems transport 293,000,000 passengers a year. During the Hudson-Fulton celebration the subways and elevated roads of the city carried a daily average of over 1,890,000 paying passengers for eight consecutive days, besides tens of thousands of the city's guests who rode free of charge.

The receipts from the street car service of the country amount to $200,000,000 per year; the net income from this is over $30,000,000.

The Interurban Rail Way.

The street car had a great mission in offering convenience and facility to city travelers, and has contributed more than almost any other item to the development of the outlying regions of our great cities.



A 1910 INTERURBAN ELECTRIC CAR

A Product of To-day. The interurban, a development of the past 15 years, is practically an extension of the urban or city street car system through the rural or semi-rural districts, connecting villages, towns or smaller places with one another and with our many metropolises.

One may even go from Boston to so distant a point as Washington, or from New York to Portland, Maine, on a series of

interurban trolleys. Another series of interurbans enables a trolley journey from New York to Chicago with only a short gap. It is said that one will soon be able to continue the journey from Chicago to St. Louis.

Its Service Limited.

Yet few people seek this means of transit for long journeys, for while fares are lower than those of the Rail Road, travel is slow compared with the steam Rail Ways, and the average American finds his time too valuable and the cost of living en route too high to make this means attractive for long runs.

As a freight carrier, the trolley is of comparatively little importance. The lines are individually short, and the frequent transshipments would alone cost as much as the entire freight charge for the shipment per Steam Road.

Capital Lacking.

Another reason is that, to provide these roads with the large amount of equipment and the terminals so essentially a part of the freight service of modern Rail Roading, would require a capital outlay which for the present does not seem available, and greater than the probable returns would warrant.

Further, the connections between interurbans are usually through the principal streets of cities and towns already crowded with their own traffic, and long lines of freight cars would not be tolerated, tending to block passenger traffic.

Still, hundreds of thousands of people have become suburbanites to minor and major cities because of the interurban trolleys; traffic and travel, merchandising and production have been stimulated. Therefore, the trolley is playing no small part in the great game of progress and prosperity

The Automobile.

Stupendous Increase.

The automobile was introduced to us in practical form but a very few years ago, although, as we mention some pages back, a steam highway vehicle is as old as or older than the Rail Road carriage.

The auto, however, had to await the development of the light, compact gasoline engine, and liquid and gaseous fuel, to become a practical vehicle. They have promoted sociability, afforded change and opportunities for amusement and recreation and have kept and will keep many people near the soil who might otherwise add to the congestion of our cities

GOLDSWORTHY GURNEY'S STEAM CARRIAGE 1829 — WM. CHURCH'S STEAM CARRIAGE BETWEEN BIRMINGHAM AND LONDON

Gurney's Steam
Cugnot's France
1790
Truxford's 1862
Buckingham Steam
Carriage 1860
Simons Steam
Tricycle
1902
1904
Haynes Apperson
1893
1911

To-day the automobile occupies a unique position. How stupendously the industry has grown may be imagined from the fact that as late as 1898 only 45 automobiles were operated in New York state; to-day over 100,000 have been registered in that state.

20,000 Autos on One Street.

It was estimated that on the first day of the Hudson-Fulton celebration in the city of New York, 20,000 automobiles drove on a single one of its avenues, Riverside Drive.

In 1908, year of depression though it was, 55,000 new automobiles, valued at $122,000,000, were turned out. The production for 1910 is estimated at 210,000 cars, valued at over a quarter of a billion, while the 1911 production, it is estimated, will be 300,000 cars, worth $375,000,000. The maintenance and operation of the 800,000 automobiles then in use will probably cost as much more. Of the 1908 and 1909 outputs probably 80 per cent were propelled by gasoline.

It is estimated that 100,000 persons are engaged in the automobile and allied industries, besides chauffeurs, repairers, etc.

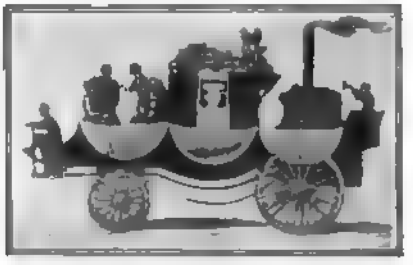
Its Greatness Still to Come.

The automobile is destined to be an important agency. But until we get good roads, for which automobilists are actively at work, the automobile will be limited in its usefulness, for, like the locomotive, it must have a good road upon which to run successfully.

As yet the automobile is not a rival of the locomotive; repairs are numerous and expensive, tires require frequent replacement and aggregate a great cost, and gasoline costs about two cents a mile for even the pleasure car.

Passenger Facilities.

While the automobile is of great convenience for personal travel, it is difficult to believe that it can ever carry heavy freight for less than the Rail Road's present charge of three-quarters of a cent per ton per mile. Labor is always the most costly item in transportation. Each automobile requires the service of at least one man—the chauffeur—and the largest load an auto of to-day can carry is 10 tons. A Rail Road train carrying 2,000 to 4,000 tons, requires the service of only six men, thus necessitating the employment of but one man to each 300 to 600 tons. Steel rails are likely to remain the smoothest, best wearing and least resisting road surface to be found.



JAMES' STEAM CARRIAGE, 1832.

In the transportation of express packages, in general delivery of small lots of merchandise, and in sending mail quickly from one post office to another, as is done in New York, Chicago and many other large cities, the automobile is, however, showing its usefulness as a utilitarian agent. The gasoline passenger car will surely come into use on branch lines of steam Rail Roads, as more economical for light traffic than entire trains.

The Motor Boat.

A New Factor.

Among the many modes of movement and carriage there is one with which all are familiar, yet which few of us, probably, would think to include in the list of carriers. This is the popular motor boat, which first came into use as a pleasure boat of small carrying capacity, and since has developed into an important passenger and freight-carrying factor for small units and short distances.

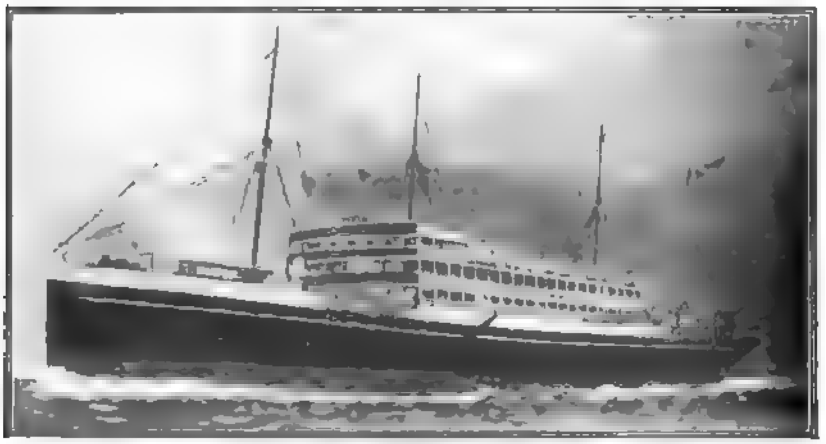
Vast Importance.

No statistics are available of the size of the fleet of motor boats in service in America, but a recent compilation of those registered in the custom houses of the country shows 14,000 of these power vessels in use. As many thousands of motor boats are below the minimum tonnage registered by the department, it can be seen that the figures given furnish only an approximate index to the importance and number of these craft. It is estimated there will be 200,000 in use in the U. S. by the end of 1911.

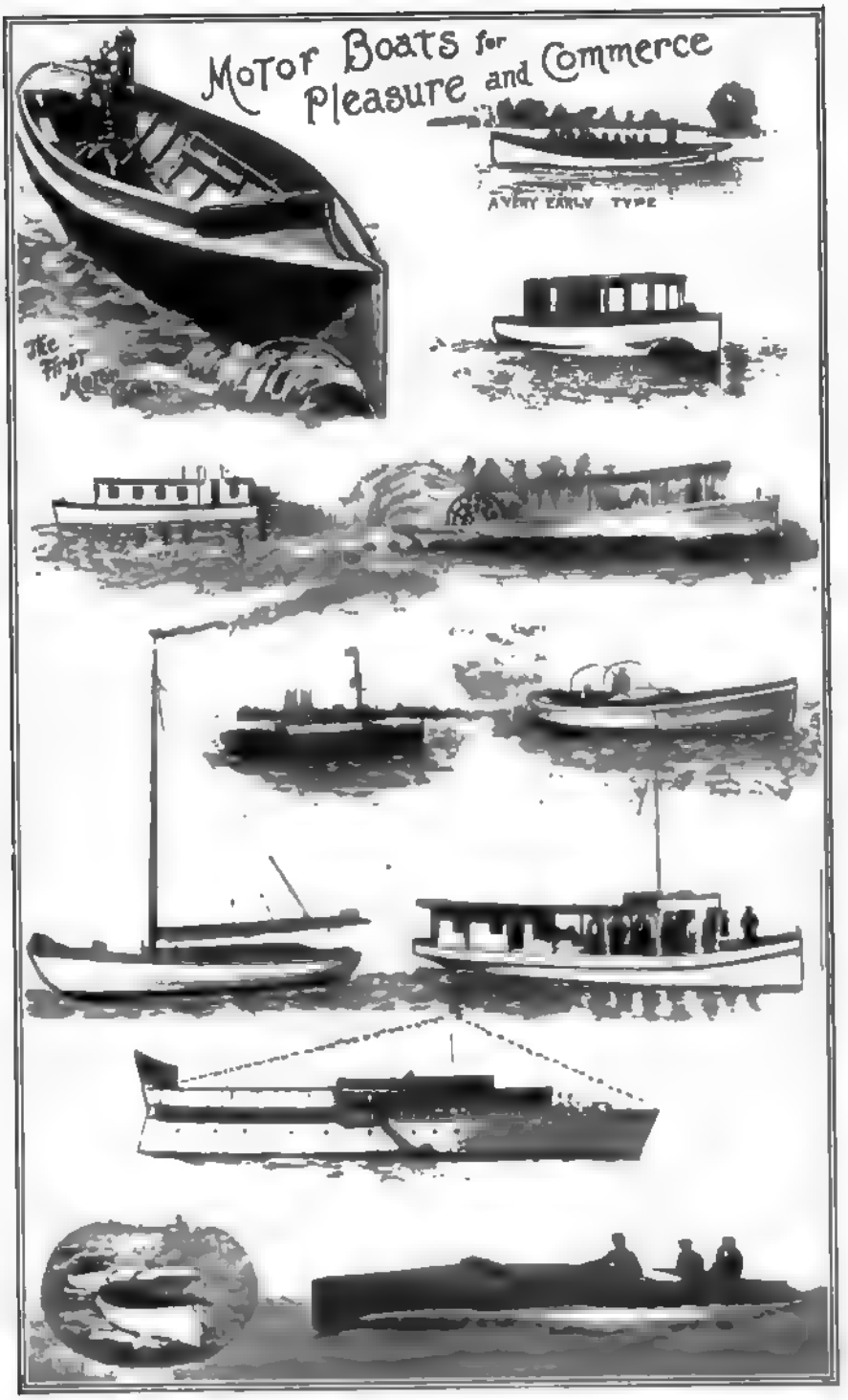
The motor boat has proven a valuable aid to progress and prosperity. Many rivers are navigable by large steamers for only a part of their length, and the large freight carriers cannot reach all the towns.

Opening New Markets.

On these water courses motor boats of several tons capacity have sometimes been installed to supplement the steamer service. Thus new markets have been opened to the manufacturers and jobbers and



A MOTOR BOAT EMPLOYING INTERNAL COMBUSTION ENGINE, WHICH HAS [illegible]


Motor Boats for Pleasure and Commerce
A VERY EARLY TYPE
THE FIRST MOTOR

the small merchant has been enabled to buy his wares to better advantage, as the motor boat frequently has opened two markets to him instead of the one by which he was served formerly. They will play an important part in the development of South American, Oriental and other countries. In our fisheries, in bays and inlets, in oystering and even for short ocean trips, they are of value already.

On the Threshold.

The era of the motor boat has scarcely begun. It is a development of the past few years, and its future is bright. Its possibilities are many; its limitations seem few. It will penetrate many of the commercially dark places of the world, and aid in letting in commerce and the light of progress and prosperity, increasing the business of the manufacturer, adding to the trade of the merchant, and requiring the employment of additional labor.

The Conquest of the Air.

The initial step in aeronautics was the ascent of the hot-air balloon of Joseph Montgolfier at Annonay, France, on June 4, 1783; four months later the first ascension of human beings in a hot-air balloon was made in the same country by Roziers and Roberts.

Up in a Balloon.

The first hydrogen gas balloon was sent up at Paris in August of that year by Charles, who, with Roberts, made the first ascension in a balloon of that type on December 1. In 1802, at Paris, Gardiner made the first parachute descent.

In 1852 Henry Gifford applied steam power to a steerable or dirigible balloon.

The development of the balloon until the advent of the dirigible was not rapid. A dirigible balloon was patented 25 years ago by an American, A. L. Blackman, on practically the lines of the famous Zeppelin airship, which presents to-day the most efficient of the lighter-than-air craft.

America's Entry.

The first important airship experiment in America was made in 1888, at Coney Island, New York, by Peter Campbell. Foot-power was used to propel this dirigible balloon. The first power airship in America was built by Leo Stevens, who, on September 15, 1902, made a short, successful flight at Manhattan Beach, New York.

Santos Dumont.

In the same year Santos Dumont made at Paris a 35-mile flight in a dirigible balloon in one hour and 45 minutes. A week later, Lebaudy made a 35-mile cross-country trip in a dirigible balloon in France.

The Zeppelin.

Even this type, however, is still crude. Its vast expense, its dependency on wind and weather, the gigantic size—the Zeppelin airship being 420 feet long and 40 feet in diameter, and containing 400,000 cubic feet of gas—combined with the frequent leakage of gas and its combustibility, make it far from a practical craft. Still, Count Zeppelin has inaugurated a parlor car aerial service for a trip of 250 miles.

One can guess what vast damage a great storm would do to an airship fleet of this class. An example of what may be expected was the wrecking of nearly all of Zeppelin's airships.

Inventions. Biplanes, monoplanes, tetrahedrals, and helicopters are interesting developments of the aeroplane, proofs of a progress in the art, but many who, in New York, waited patiently or impatiently for nearly a week for suitable weather to enable one of the greatest of all aviators, Orville Wright, to make a flight, became convinced that this type of machine, wonderful as it is, is not yet ready to cope with or conquer nature in her strenuous moods, or even in those moments when comparative quiet reigns, although Glenn Curtiss performed the feat of flying from New York to Albany, and Hamilton that of flying from New York to Philadelphia and back.

Long Flights Begin. Louis Bleriot flew across the English Channel in 1909, covering 21 miles in 23 minutes. Count De Lesseps duplicated this feat in May, 1910, and Paulhan flew from London to Manchester about the same time.

Restrictions. The highest development of heavier-than-air machines has been found capable of carrying a dozen people, weighing 2,400 pounds, while Zeppelin's airship can carry 22 tons.

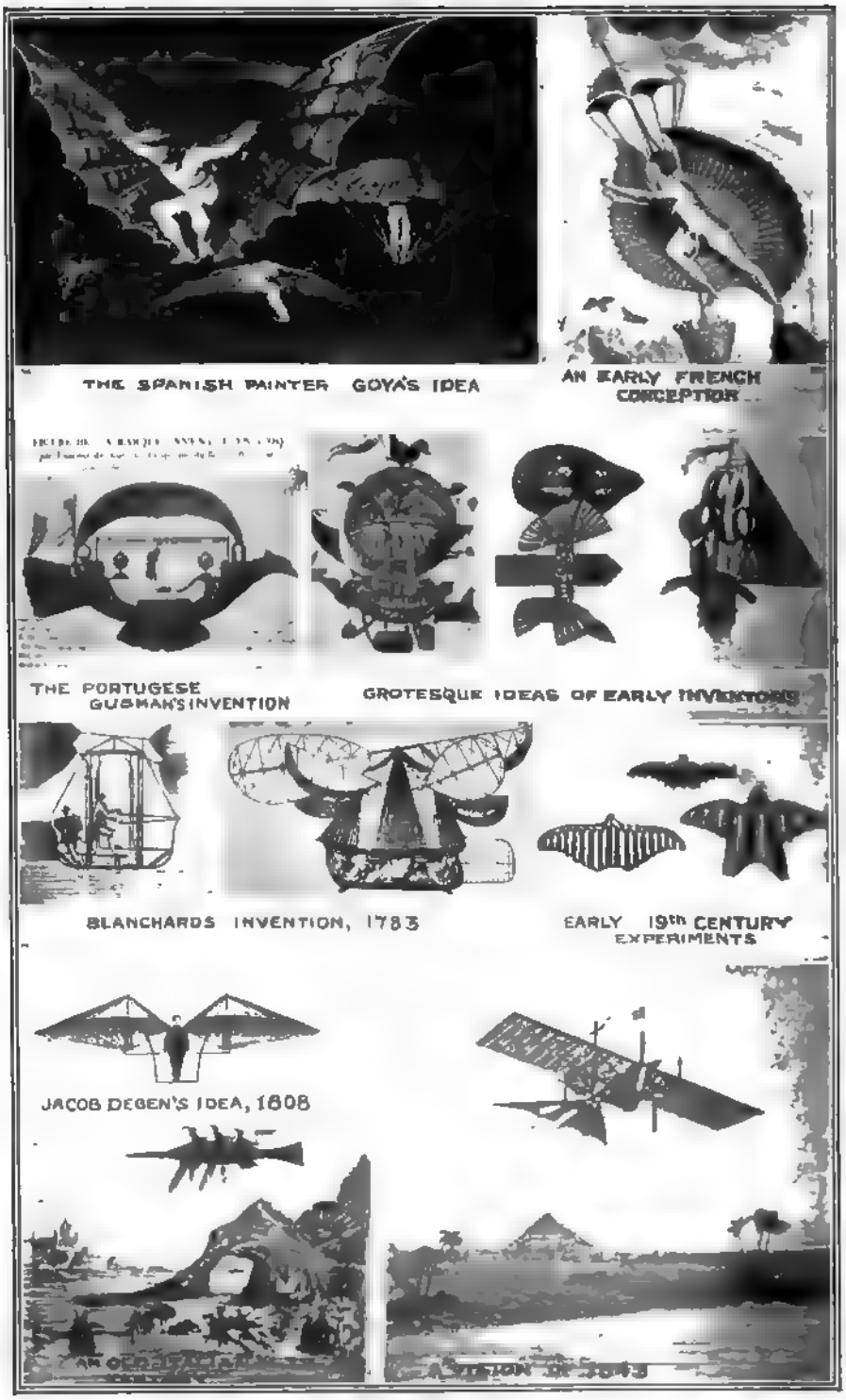
Decided steps forward must, therefore, be made before we can have 50-ton aerial cars. It is easy to see how many airships are now necessary to handle a modern freight train load of goods.

New Difficulties. The aerialist has, perhaps, the most difficult of all problems of transportation when weight carrying comes into consideration, for the Rail Way car transfers its weight to the earth as does the ship to the water, but air is 800 times lighter than water, and it is estimated that the specific gravity of earth is five and a half times that of water. The weight of the earth, as compared with that of the air, is, therefore, 4,400 to one. One can imagine how large a surface of the air must be covered to sustain any substantial weight.

Further serious complications might be expected if 50-ton aerial coal-cars met with an accident while up in the air, and this would give good cause for apprehension to all people of nervous or timid temperament. In fact, in Berlin a law has already been passed prohibiting flying over the city, and an aviator was recently fined for doing so.

Wellman's famous failure at a transatlantic passage, and another ship building for a similar attempt, show the ambition of inventors in this direction.

New history is being made every day in the science of the navigation of the air. The heavier-than-air machine, however, will always labor under the difficulty of its inability to rest in the air, or even to stop its engines for any purpose, without coming to earth. And as a large portion of the earth's surface is water and much of the land rough-timbered, or offering impossible or dangerous landing places there are difficulties to overcome.



PRIMITIVE CONCEPTIONS OF AIRCRAFT

THE DEVELOPMENT OF THE MODERN AEROPLANE.

A COAL TRAIN OF THE LEHIGH VALLEY RAILROAD.

SECTION XXVIII.

RAIL WAY RATES.

The Principles of Rate Making.

Rates. Few questions are more frequently discussed, though few appear more misunderstood than that of Rail Road rates. Probably there are few other subjects of which the public outside of a small circle made up of the large shippers—has so little knowledge, or at most only general information.

If the Rail Roads play an important part in our economics, it seems important that the public know what are the underlying principles and laws of rate making, just as we should know the physiology of our bodies; we should know why car load freight rates are lower than rates for smaller shipments; why flat rates are impracticable, or rather, why they are hard to maintain.

In fairness to ourselves as well as to the Rail Roads we should post ourselves and get full light on the subject. Then we shall have the right to condemn or approve the course of the makers of rates.

Rate Making Certain economic laws, the outgrowth of common sense, and which are ordinary business principles, govern in rate making.

It is obvious, for instance, that the cost to the Rail Road, for the transportation of each ton per mile in a solid train which is

moving over a considerable distance without its contents being disturbed, is lower than the cost of each ton per mile of a train consisting of cars gathered up at different points and consigned to local points en route, each car, though only partly utilized, carrying a variety of goods in a number of separate packages with different destinations. It follows that the commodities which move in the former shape are entitled to lower rates.

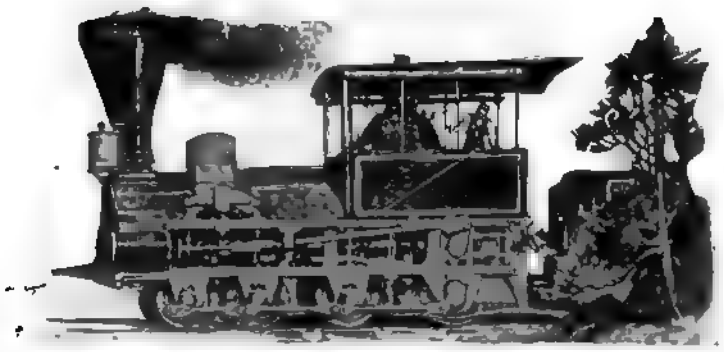
Beaten Tracks. Shipments of the long-haul class usually travel along the great American trade routes to the wholesale centers of St. Louis, Chicago, Boston, New York, Philadelphia, etc., the distributing points for much of our traffic, both foreign and domestic. Centers like these, situated on water ways, were the first to be connected by Rail Roads.

Making New Centers. Later, the modern carriage system created an infinite number of other centers, for artificial avenues enable the extension of trade and create towns and cities. If freight charges for long shipments were not reduced to a basis lower than that for transportation for a single mile, the cost of carriage would be so high as to destroy the market value of the product.

Between points several hundred miles apart, there may be two roads along different routes, one of which has a short line, low gradients and other advantages which reduce the cost of operation and enable it to make a low through rate. To get any share of the through traffic the Rail Road with the least of these advantages must reduce rates between the competitive towns, although these may be for a considerably lower average per mile than for intermediate points, or places in another direction, where conditions differ.

Of Vital Interest. Few persons living along a Rail Road realize how vitally they are interested in the long trains of through freight. Without this through business, the local rates would have to be increased to such an extent to keep up the road and its service, that they would be practically prohibitive

A. D., L. & W. BRIDGE, BUFFALO DIVISION



A WOOD BURNING ENGINE, MIDDLE PERIOD.

The average of fixed charges per mile is about $2,700; including fixed charges, the operating expenses average $7,300 per mile. The local shippers living along each mile would have to pay these charges or a considerable portion of them, if Rail Roads did not make through shipments possible by reductions of rates on long hauls. It would practically devolve upon the shippers living along each mile of Rail Road, if they wanted to enjoy modern transportation facilities, to pay the greater part of this, making the cost of short hauls much greater than it is at present.

Volume of Traffic, Its Influence and Benefits.

Dividing Expenses.

Through traffic means division of expenses. The result is ability to serve the local merchant or producer much more cheaply than would be possible if the latter had to carry the entire cost of conducting the business.

The merchant who is expecting to do business with only a few customers, making no more than normal purchases, is compelled to charge high for his wares to receive sufficient to make up for the lack of volume of trade.

Along somewhat the same lines, it may be said that when a good sized train is stopped, the wear and tear upon the brake-shoes and equipment would hardly be made up from the ordinary revenue from a small package of freight.

The People's Protection.

Freight charges on any commodity are, as a rule, but a small, if not insignificant part of the cost of production, and a merchant's and producer's profit must be left after deducting the transportation charges from the selling value at destination.

In other words, if the rate charged by the Rail Roads be so high as to prevent a profit when the goods compete in the market, the producer will not ship his wares, even though he is thereby deprived of every chance to sell them.

WINAN'S DELAWARE, 1846.

Profits in Quantity.

The Rail Roads must seek to run the largest possible number of trains, composed of the greatest number of loaded cars, filled with the largest quantities of goods. These enable such low charges as to allow products and manufactured articles to find the widest markets and meet competition from all sources.

An able writer upon traffic, Prof. Logan G. McPherson, says that the traffic which cannot find a market unless it is hauled 500 miles at the same rate it is hauled 50 miles, must be hauled 500 miles at that rate, otherwise it will not be hauled at all. If a basis of charges enabling this is not arrived at, the producers would be deprived of their livelihood, and consumers of that source of supply, which means so much less business for the country and a consequent curtailment of spending power.

Hill's Aid to West and East.

When James J. Hill reduced the rate on lumber to a point which enabled the products of the forests of Washington and Oregon to be sold in the East, he gave a new market to those products and at the same time gave traffic to the Rail Road for a class of cars which otherwise would have been returned to the East empty.

Both East and West were benefited, one by a market and the other by cheap lumber. The shipper had part of the burden borne of hauling back empty cars, which would otherwise have been reflected in the rates on the freight going West.

The Average Carload.

Partly as a consequence of this policy, the Great Northern has an average load of 24 tons per car, the highest of any road in America. The average car load in the United States is only 19 tons. Figuring full with empty cars hauled, the average car haul is only 13 tons.

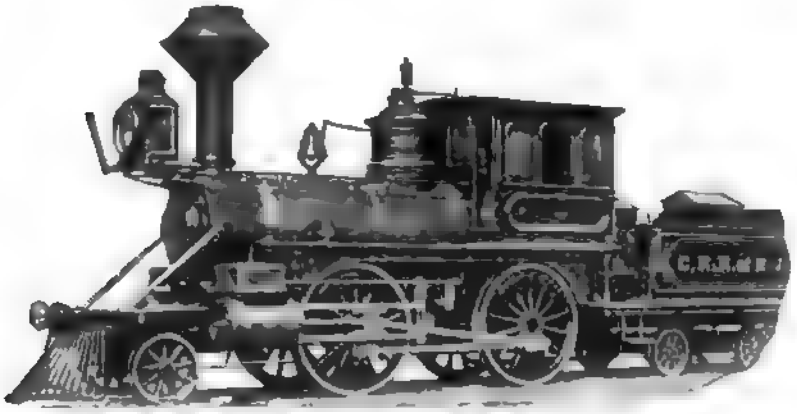
When a new source of revenue is added to the income of a Rail Road, by the allowance of especially cheap rates on a particular commodity, it is immediately advantageous to the producer and shipper of that commodity. As soon as such traffic has a fixed quantity, upon which the Rail Road can depend, there will be the

chance of benefit to all who use the Rail Road, in making lower rates possible by a further division of expenses.

Safeguarding the Trader. Legislators intending to safeguard the interests of the shipper, in setting certain arbitrary rates which they consider reasonable Rail Road charges, should use far sighted as well as near sighted glasses. Such law making deprives rates of that element of elasticity existing under competition. The latter creates and encourages new industries, on which the best interests of all are dependent. If the power to make rates be placed completely in the hands of commissions, the keen incentive to reduce operating expenses is lacking, for the Steam Road merchants would feel that rates would be allowed to return only a certain percentage on their investment.

As in England, if a rate were reduced, it would be difficult ever to get it up again, and a low rate to encourage a new industry, find new traffic or increase the road's volume of traffic, could be used as a lever to lower all rates. This would serve to discourage, rather than encourage reductions.

All or None. In the days of untrammeled competition it was found that a road which named higher rates than another on a particular commodity, lost that and all subsidiary business. For example, one road declined to cut the rate on cattle to meet the rate of a rival road. The result was the farmers not only gave their cattle business to the low rate road, but also took their poultry, eggs, etc., to it.



A Central Railroad of New Jersey locomotive, middle period

The Basis of Freight Rates.

Rate Wars. Where there was scant volume of traffic and more than one Rail Road, there has been naturally the greatest and keenest competition. This competition has resulted in rate wars that wrecked many a Rail Road. The only way to prevent such suicidal conditions was by adopting uniform charges

Under the general rate agreement, the two most important

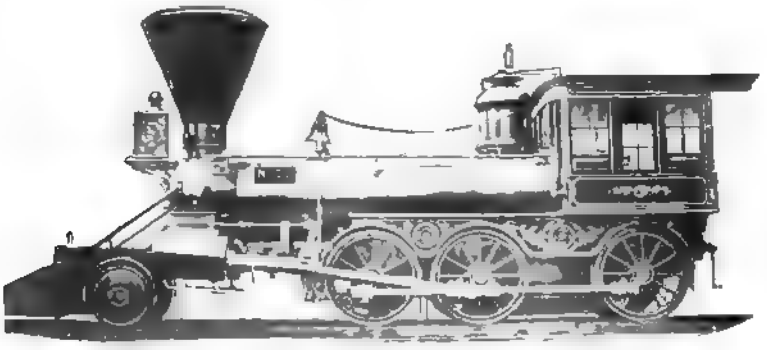
centers of traffic, New York and Chicago, between which the greatest volume of traffic flows, are taken as the basis for rates throughout the district east of the Mississippi and north of the Ohio.

100 Per Cent Rates. The rates on commodities between New York and Chicago are the results of contests that have been fought to a finish by the transportation agents and the communities concerned. They are designated as 100 per cent rates, i. e., as the standard of Rail Road rates, just as the dollar is the standard of our money.

The rates between other cities, also arrived at through contests and competition, are figured as percentages of the unit rate. For example, the rate from New York to Cleveland is 71, to Pittsburgh 50, to Detroit 78, to Indianapolis 93, to Peoria 110, and to St. Louis 117 per cent of the New York-Chicago rate.

Must Move Together. If a single rate be reduced, the rivalries of other consuming and competing points and the necessity for equal advantages to all shippers may produce a change in the rail rates within this entire territory. Further, these may induce changes of combined rail and lake transportation rates and of all-water rates like those of the Great Lakes and Erie Canal. Even rates on freight originating west of the Mississippi and south of the Ohio may be affected.

How the adjustment of rates equalizes geographical advantages and allows a general division of opportunity, we may see from the following:



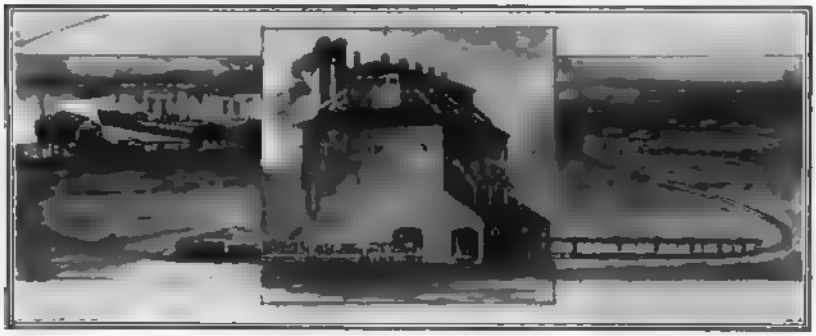
BOOTH, MADISON, 1875

The Iron Industry. The rate on iron ore from the lakes to the furnaces in the Lehigh valley of Eastern Pennsylvania, is approximately 35 cents higher per ton than the rate on iron ore hauled from the Great Lakes to Pittsburgh, which is much nearer to them.

Now, a large part of the iron product comes to the Atlantic Coast, and the rate thither from Pittsburgh is sufficiently above the charge from the Lehigh valley to equalize the higher freight charge on the shipment of the ore to the Lehigh valley, and puts them on an exactly even footing in eastern markets

Preventing Shut-Downs.

Milling in transit and for export is allowed on through rates, and by this arrangement, a miller in say, Dayton, can stop grain which passes through his city, grind it, and let it go on to its destination at a through rate. Thus, if the mill uses up the local supply of wheat or overstocks the local market or its normal trade, it need not shut down, the Rail Roads enabling outside shippers to give business to the mill at no extra cost to them.



GRAIN MAY BE STOPPED IN TRANSIT FOR MILLING.

Southern Rates.

The interdependence and union of rates reigning in the above mentioned section, also rule in the territory south of the Ohio and east of the Mississippi

North and South.

It is said that a change in two rates, from Baltimore and Louisville to Atlanta, brought with it the reduction of rates between points such as Baltimore and the South Atlantic as far as Florida, as well as rates from points in that territory to Boston, New York, Philadelphia and other Eastern seaports, the interior cities of the East and of the Mississippi and Ohio valleys, affecting not less than 100,000 rates.

Another territory with interdependent rates is that west of the Mississippi, finding its ports at Galveston and New Orleans. The reduction of rates from and to Galveston and New Orleans would affect those in the entire territory as far west as Denver and as far north as the Canadian border. A change of rates between a point in this and one of the other sections named would be felt throughout the country

Absolute Justice.

In other words, practically no rate can be reduced without the institution of other changes affecting the entire territory There can be no individual favoritism No man with an established trade today, depending on favorable traffic conditions, will have it arbitrarily taken from him to-morrow

To keep traffic from centralization and the great centers from

triumphant domination over their small neighbors, rates to the metropolises are not below those to their suburban territories and the small towns surrounding them. Yet the great city gets traffic in wholesale quantities, which in every other business is recognized by the giving of discounts.

When cheaper labor is taken into consideration, the chances for the success of a manufacturer in a small place are equal to, if not better than those of his neighbor in the great city.

Interlocked.

The above shows clearly the intimate alliance and interlocking of interests between our Rail Roads and our communities. While our rate making system may not be perfect, it would seem to be as equitable as possible, and to the best interests of the nation. The proof of its efficiency is that under it our country has thriven and outstripped all others in the world, and that to-day every section enjoys its part in the general progress and prosperity.

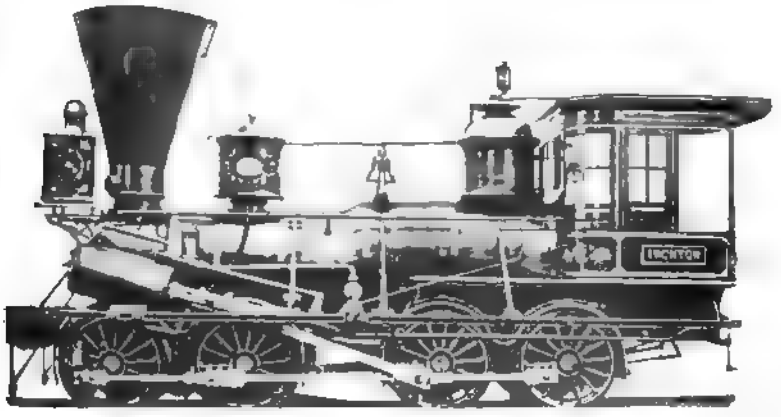
Classification of Freight.

Many persons wonder why Rail Road freight charges are lower on some goods than on others. At first glance it seems to the layman that a ton of feathers should be hauled as cheaply as a ton of iron, or lace at the same cost as an equal weight of bagging. The reason why this is not so, is simple and can be readily grasped.

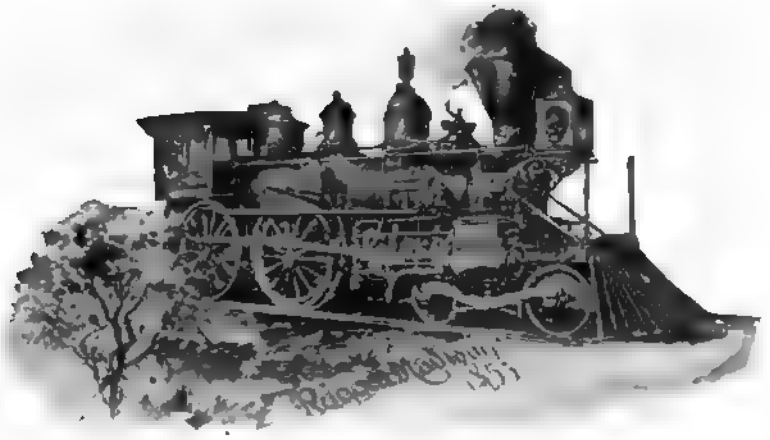
Start of Classification.

The classification of land freight began in the days of wagon hauling by teamsters. Our first record comes from South Carolina, dating from the time when wagoners discovered that they were hauling goods of little weight, though of considerable value, for no more per pound than they charged for heavy goods of low value. A schedule of freight charges was then adopted which was graded with some regard to the wares carried

The first step in this direction by a Rail Road was taken in 1855 by the Southern, which established four classes, embracing 300 commodities, and adopted a tariff based on the cubic contents



THE LOCOMOTIVE IRONTON



A Middle of the Century Carrier.

of light-weight articles, charging by the hundred weight for heavy goods, as do water carriers.

The Alternative. The only method of fixing a rate solely on the weight of the article, would be to ascertain the total cost of transporting all traffic for a given time, including administrative and maintenance expenses and taxes. To this must also be added the amount necessary to furnish sufficient return on the capital invested, and to provide a surplus for emergencies. From this total could be determined the average cost of transporting one ton one mile.

Impractical. If, however, the rate were determined in the manner described, the Rail Roads would charge no more for hauling a ton of dry goods than for hauling the same weight of coal. The transportation expense would then add so much to the price of coal that where long shipments are necessary, the relative value of these two classes of commodities would be greatly changed at destination, causing endless confusion and a severe setback to our prosperity.

The Rail Road, too, would find itself in a peculiar position. A dozen train loads of dry goods weigh no more than a single train load of coal. But the 12 trains would bring in no more gross revenue than the one of coal, on a basis of weight, although operating costs would be substantially 12 times as great.

The Cubic Contents Basis. If rates were based solely on cubic contents, coke would carry a rate two and a half times higher than an equal weight of coal, for it occupies space that much greater than the coal. If a certain weight of coal would fill two large gondolas, an equal weight of coke would fill five, for coke is lighter than coal, of which it is only a product. As a matter of fact, the present rate on coke is usually but 30 per cent above the coal rate, thus gaining fair and economic results, special care being provided for the coke.

The present classification includes about 8,000 commodities. A rate is based upon the value of the article, its bulk, its weight, its liability to damage and the necessity for special equipment.

Receipts Above Expenditures. These classifications must be fixed so that the rates levied will hamper no industry by being too high, yet the expenditures of the road in transporting the wares, including all charges, must not exceed its receipts, for our roads, unlike many European lines, cannot have deficiencies or losses made up by taxation through the government.

A Rail Road entering an undeveloped country must experiment with its rates, even though careful study be made of the charges, traffic volume and other conditions of roads passing through similar sections. The volume of traffic in any particular community cannot be accurately estimated beforehand, and rates depend on that.

The older Rail Roads, however, have evolved rates fair to the shipper and productive of sufficient business and income.

Endless List of Reasons. There is an almost endless list of reasons why particular commodities fall into certain classes, although it happens that the shipper himself does not always appreciate the distinctions on which the variations are based, and fancies injustice has been done him.

Coal is less valuable than iron girders; loading and unloading are done by consignor and consignee, and it usually travels in train loads; hence, there is a minimum of labor for the transportation company to furnish. Coal is, therefore, charged a lower rate.

Sponges are bulky, though they weigh little; their bulk necessitates a higher rate than flour, which is compact.

Variations. Furniture is more bulky, more valuable and more liable to damage in transit than lumber, and a three hundred weight consignment of straw hats takes up much more space than many three hundred weights of hardware. In both cases, therefore, the former is charged more than the latter.

Common sense economic laws and commercial necessities require that raw and crude materials must and should enjoy lower rates than fabricated products.

Raw Material Cheaper. Rates are lower upon pig iron than upon billets, blooms and ingots, and lower upon the latter than on implements of iron and steel. Rates are lower on raw silk and cotton than on the manufactured goods; live stock rates are less than those on dressed beef, and rates upon precious ores are less than upon bullion.

For Infant Industries. To encourage manufacture, Rail Roads in many cases have made rates on raw material barely sufficient to cover the immediate expenses of transportation. The aim in such cases has been to secure the return traffic of the resulting manufactured product, and the traffic in general supplies demanded by the factory and its employes.

From the above may be gained some idea of the efforts made to establish rates upon a basis which will best preserve and foster the prosperity of the nation as a whole.

PASSENGER RATES.

Is a Uniform Rate of Two Cents a Mile Equitable or Inequitable?

One of those important questions which threatened the value of a considerable portion of the nation's wealth, reflected itself on all values, and was a factor in bringing about the grave commercial crisis of 1907-8, was that of Rail Way passenger rates. Neither discussion nor regulation seems to have found a practical solution of the question.

Non-Profitable. It may not be generally known that in view of its tremendous complexity, expense and responsibilities, passenger traffic has long been regarded as of little if any advantage to many Railed Roads.

In its early days the Baltimore & Ohio went so far as seriously to consider the discontinuance of all passenger trains, and only abandoned its purpose at the earnest request of the citizens of Maryland, and after the City of Baltimore asserted its rights as a large holder of the Road's securities.

A Direct Loss. Rail Roads cater to the public convenience to an extent little realized, and meet the desires of the traveling public in a way that few business concerns would imitate for the benefit of only one class of their customers. Recently, the Steam Roads spent approximately 45 per cent of their operating expenses for passenger traffic, which brought in less than 25 per cent of the gross earnings.

The impression that in uniform mileage rates lies the panacea for all anomalies in Rail Way charges still exists in the minds of many, in spite of a half century of experience to the contrary, and in spite of its condemnation in England by every Royal or Parliamentary Commission which has investigated the subject.

Rate not an Incentive. It is an established fact that the volume of passenger traffic on a Rail Road is largely dependent upon business conditions, the season of the year, weather conditions and the density of population, rather than upon the rate of passenger fare.

Europe has an area of 3,973,000 square miles and a popula-

AMERICAN RAILWAYS HAVE ONLY ONE FIFTH AS MANY PEOPLE TO THE MILE AS EUROPEAN.

A HOME OF A DIGGER INDIAN.

tion of 430,000,000, which is 113 persons to a square mile. The Rail Road mileage is about 200,000, and the population averages the equivalent of a town of 2,150 people for each mile of line. Europe, therefore, averages more than five times our density of population, which is only 26 per square mile of territory and 390 to a line mile of Rail Road. The length of our lines in proportion to area, is almost 50 per cent more than Europe's average.

Little Rhody. The only state in the Union whose population approximates the average density of the population of Europe, is Rhode Island, where there are practically 2,000 people to support each mile of Rail Road. In Massachusetts there are about 1,400. In Wyoming there are about 80 people per mile; in New Mexico about 83; in Arizona about 75, and in Nevada only about 38.

Hughes' Example. Charles E. Hughes, who succeeded Mr. Justice Brewer in the United States Supreme Court, vetoed a bill, as Governor of New York, limiting the maximum rate of charge for passenger service upon the Rail Roads of that state, to two cents a mile.

In substance, he gave among his reasons for the veto, the fact that the volume of traffic is largely governed by the density of population, and unless people be reasonably distributed along the different Rail Road lines in the state, it seems impossible to make such an enactment fair.

Distribution of Traffic.

Difficult Conditions. Acknowledging that the population might be evenly distributed, in habits, customs or needs, the people in various sections differ greatly from each other, and those of one region, in many cases, travel much more frequently than those of another. We know that the

people along the line of a Rail Road near an important city travel much oftener than those in a rural community.

Proportionately High.

The principal Rail Roads in the thickly populated sections of the state of New York have been making a uniform rate of two cents per mile for years. In sections of the Adirondacks and Catskill Mountains, where population is sparse, and where for six or eight months of the year the passenger traffic is largely at a standstill, such a requirement would be obviously inequitable, and rates there are higher.

How Can It Be Done?

If a flat two-cent rate is inequitable and inapplicable in the state of New York, would it not seem to be still more inequitable in desert sections of the West, where the population is at a minimum? For instance, the total population, in all cities, towns and stations, on the link of the Atchison, Topeka & Santa Fe Road, between Rincon, New Mexico, and Redlands, California, a distance of 824 miles, is approximately 15,000, a large percentage of whom are employes; the total is about equal to the population of Glens Falls, New York, or half that of Aurora, Illinois. Would a two-cent fare be equitable under such conditions?

In Texas, which has passed a two-cent law, the total population between Fort Worth and El Paso, 613 miles, would not equal that of many a town in the United States whose name even you probably never have heard. The same is substantially true on the line from Houston to El Paso, 826 miles.

Difference in Two Regions.

The people in all the cities, towns and stations on the 1,431 miles of the Southern and Texas Pacific Rail Roads, between San Antonio, Texas, and Los Angeles, Cal., number less than 50,000 in toto, or only two-thirds of the number of inhabitants of Yonkers, N. Y. The average is 34 to the mile, a number of whom are Rail Road employes; there are 148 stations without any population save Rail Road employes.

The distance of 1,431 miles, practically barren of a revenue-paying passenger population, is almost as great as the distance

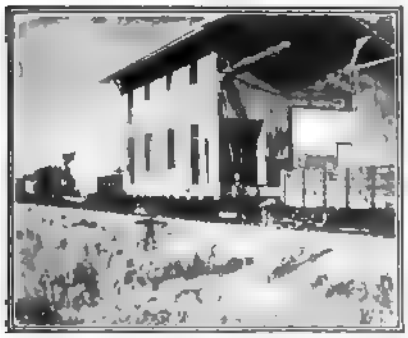
Top of a snow shed in the Sierras, Cal.

from New York City to Winnipeg, Man., to reach which one passes through such cities as Albany, Schenectady, Utica, Auburn, Syracuse, Rochester, Buffalo, Erie, Cleveland, Toledo, Detroit, Chicago, Milwaukee, St. Paul and dozens of minor cities and towns, teeming with a total of millions of people.

Law of Nature. Can we make the same rate equitable under such widely varying conditions of population and traffic? Does it not seem to be a question decided by nature and the distribution of population—one which neither legislation nor transportation companies can arbitrarily regulate?

Little can be done to encourage passenger traffic in certain Western regions, where cattle is about the only product of hundreds of square miles of country. These are the principal passengers, and they make only one trip, requiring no return ticket.

Cattle Ranges. The writer has traveled on trains through such regions and found scarcely a handful of passengers on each. Even at a three-cent-a-mile rate, the receipts of the train were barely enough to pay the wages of the train hands and the cost of fuel, without reckoning the other items entering into the expense of operation, to say nothing of upkeep and interest.



MOVING A STATION IN NEW MEXICO BECAUSE THE TOWN HAD BECOME DESERTED. IN EUROPE THERE ARE 2,150 PEOPLE TO A MILE OF RAILROAD AS AGAINST ONLY 190 IN THE UNITED STATES

GREAT SALT LAKE CUT OFF.

The writer remembers when the traffic would support but one passenger train a day east and one west on the Southern Pacific or Sunset route. There was one so-called "special" the predecessor of the present Sunset Limited, which at certain seasons of the year made trips only once or twice a week

Changed Conditions. If Rail Road service throughout the country is to be paid for at the rates ruling in the most populous districts, we should get eggs or strawberries as cheaply in the Klondyke as on a Jersey hen ranch or truck farm.

Some of the Results.

Results Not Satisfactory. A fixed rate has usually proven anything but beneficial in its effects. In Michigan the rate which Rail Roads may charge for carrying passengers is fixed by law on a sliding scale, being governed by the gross earnings of passenger trains per mile operated. As a result, little new Rail Road mileage has been constructed during the past five years, although Michigan has 9,000,000 acres of valuable land from which the timber has been cut, settlement of which is desirable.

On the Grand Rapids & Indiana Rail Road, partly lying in Michigan, the revenue from passenger fares increased, under the three-cent-a-mile rate, from $1,232 per mile in 1897, to $2,613 in 1903, or 112 per cent, an average increase per year of 19 per cent.

An Example. On April 14, 1903, the maximum fare on the Michigan part of the road was reduced to two and a half cents a mile. The result was that from 1903 to 1905, notwithstanding greatly increased traffic and correspondingly enlarged facilities, the returns from passengers' fares per mile only increased from $2,613 to $2,636, or 1.3 per cent, an average of six-tenths of one per cent per annum.

Wasted Energy. On most regular runs, strange to say, there is wasted anywhere up to 99 per cent of passenger hauling power. The average waste is 88 per cent. The average locomotive exerts the power for and is capable of pulling 500 or more passengers, and handling them on a good fast schedule, whereas the average number of people per train is only about 58, only enough to fill four-fifths of a single modern passenger coach.

A TRAIN WITH SOLID STEEL EQUIPMENT, PENN. RY.

The cost of running the average passenger train is over a dollar per mile, and the average passenger train receipts are only $1.11 per mile.

Mixed Trains. Time was when passengers and freight were hauled on the same train. With this combination the maximum capacity of the motive power was more nearly realized. But the resulting inconveniences are so many that to-day the traveling public will have little or none of mixed trains.

It may be of interest to note, for the sake of comparison, that the writer recently was charged two cents per mile for the priv-

ilege of traveling over turnpikes, furnishing his own horse for motive power.

In Pennsylvania, just outside of Philadelphia, he was charged an average of about 10 cents per mile for permission to run an automobile over a turnpike. How does this compare with the requirement of much recent legislation, making it compulsory to furnish a steel track upon a stone-faced road, the vehicle and the motive power, for two cents a mile?

One's Food, Another's Poison.

Steam Roads would very gladly make a one-cent-a-mile passenger fare, if a general advance of one-quarter of a cent a mile per ton of freight carried were allowed. Such a charge, however, while to the advantage of those who travel frequently, would be a disadvantage to the laborer, the producer, and the average consumer.

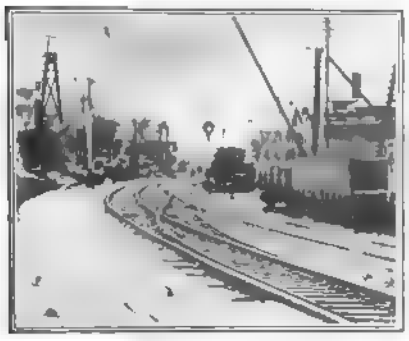
The Commuter.

The cheap rates allowed to commuters may be compared with the charge that would be made by a livery stable under the following circumstances

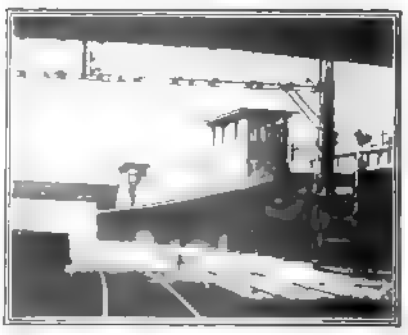
Wholesale vs. Retail.

Let us assume that the owner of a livery stable keeps rigs running past two men's houses throughout the year. Would he or could he charge one of these men, who rides only once a year, the same rate as the other man, who rides every day, good weather or bad, paying whether he avails himself of the service or not? If the same rate were made, would it be fair to the constant traveler?

Commuting rates are very low and in many cases unprofitable. The average receipts from the commuter of the Rail Roads out of New York are only about 10 cents per trip. At this rate a fully occupied New York Central steel car, seating 52 people, would bring in a gross revenue of only $5.20. If this car were to make a trip into the city in the morning and back to the suburbs at night, the gross revenue would be only $10.40 for hauling 104 people, an average of say 20 miles each per trip.



BEFORE TRACK GRADING, NEWARK.



AFTER TRACK GRADING, NEWARK.

River view of the Delaware & Lackawanna passenger terminal.

Revenue and Investment.

In other words, this car, costing $7,000 to $10,000, drawn by an iron horse costing $18,000, on a track costing millions, would take in, gross, no more money per day than is made in two round trips by an ordinary hack, costing, with the horses, perhaps a thousand dollars, carrying no more than four persons on each trip between one of New York's hotels and Grant's Tomb, traveling a total of 16 miles.

The comparison of the investment in the two cases, the distance traversed, the number of persons handled and the revenue received, is worthy of thoughtful consideration.

Terminal Cost Per Passenger.

It is a fact that the interest and maintenance cost of New York stations, divided among the total number of persons arriving at and departing from the terminals daily, runs from 5 to 10½ cents per passenger. This amount must in every case be deducted from the gross receipts from each passenger before anything is allowed for the fuel, the train crew and the many other expenses.

An increase of commuting rates to equalize the returns from this class of business out of New York was vigorously opposed, in one case on the ground that the business of the road as a whole was prosperous and that the "lean and the fat" should be taken together.

The Two Liverymen.

The same individual who has ridden perhaps 15 miles for 10 cents does not grudge the local hackman, who meets him at the station, with perhaps $250 invested in his business, 25 cents to drive him to his home a half mile or perhaps a mile distant. If the local driver were losing money at that rate, the commuter would not expect him to continue to carry him at a loss.

Have you ever ordered a rig, without being met with a query as to your prospective journey and the road over which you intended to travel? In fact, the usual questions to which the liveryman expects answers, and his comments, are:

A Biography.

"Where are you going?" "How long will you be gone?" "What road are you going to take?" "Well, that is a pretty bad one; I'll have to ask something extra for that." "You'd better leave a deposit, because you are liable to break the rig or lame the horse."

The liveryman has learned that a trip over a rocky, moun-

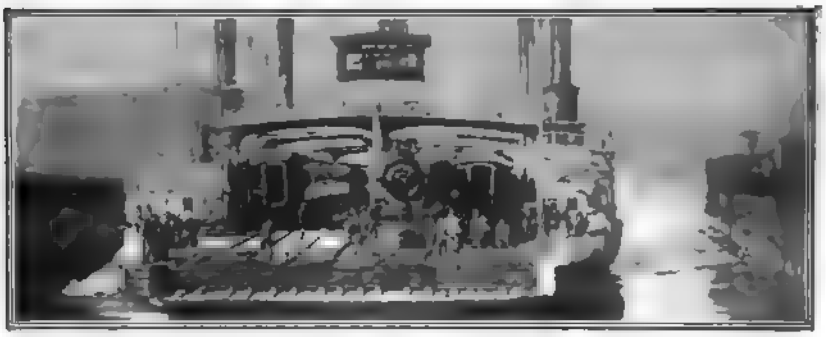
tainous road does great damage to and is more wearing on vehicle and horseflesh than a trip over well graded turnpikes.

How would you like to be the liveryman and be forced by law to make the same charge for the trip over the mountain road as over the turnpike, over a bad road as over a good road, whether there is a 'bus load or a buggy load of persons to be carried, and also regardless of cost of feed, water and supplies?

Compulsory Expenditures.

Rail Roading is different from, less elastic and very much more complicated than almost any other line of business. It takes a long time to make up schedules, and trains once established must be maintained, whether there is good weather or bad, and whether there is anyone to ride in them or not; the public usually demurs vigorously if any be withdrawn.

The unseen expenses of operation and maintenance are very large, and, in connection with such facts as are given above, should be taken into consideration to arrive at an equitable adjustment of passenger rates.



TRAIN FERRY, BENICIA, CAL.

EMPTY AND IDLE CARS.

An Unrealized Addition to the Cost of Carriage.

Half Million Empties.

During the depression of 1907-8, there were at one time more than 420,000 idle cars congesting sidetracks, generally at out-of-the-way points, where they were placed so that they might not block the lines and thus interfere with the smooth conduct of the transportation business. In addition, there was the usual quota of empty cars in transit—approximately 600,000.

Merely at the per diem charge of 35 cents, the idle cars represented a dead loss to the Rail Roads of $147,000 a day; adding the depreciation of these cars brought the loss to the Rail Roads to approximately a million dollars a week. This is the interest on about $1,300,000,000 at the average rate paid by the Rail Roads.

Hauled Free. In the single month of January, 1908, the equivalent of 550,000,000 non-revenue-producing cars had to be hauled one mile. This, of course, was exceptional. But throughout the year, in good times as well as bad. there is a large percentage of cars which for a time brings in no return.

Broadly, the great trade wind of the world drives the current of traffic in the United States, in well-defined channels from the west to the east. Food products and raw materials go east in large quantities to be consumed, exported, or returned in manufactured form.

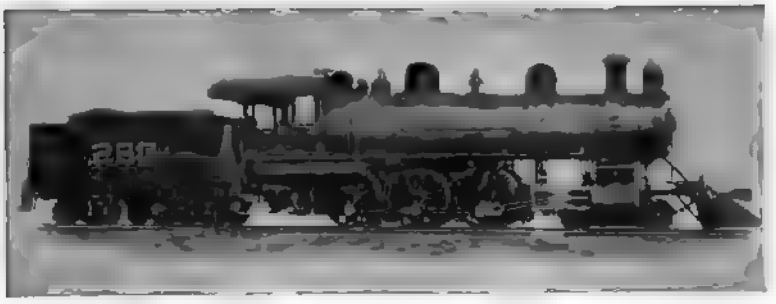
West and East. The traffic to the west, on the other hand, consists so largely of finished or manufactured articles, that it lacks in bulk and is of less weight and volume than the materials which make the journey east. In fact, the average west-bound carload on the Pennsylvania is only 9.5 tons.

A FREIGHT TRAIN OF 38 LOADED CARS

As a consequence, this traffic requires fewer cars, and there are many surplus empty ones to be hauled back to the west before they can again be loaded. The most visible and numerous of these empties are the great trains of coal, stock, ore or refrigerator cars, most of which are built and can be used for specified commodities only; they are engaged solely to haul material to the point of consumption, there seldom being a return load of material of the class to which they are adapted.

Peculiarities of Traffic. Another cause of empties, even in periods of car shortage, is the peculiarity of Rail Road traffic, which sometimes gives one road a superabundance of a particular business and its neighbor little or none. Recent reports show that in a certain group of states only 54 cars out of 100 were actually earning income by being at least partly loaded On some of the roads less than 50 per cent of the cars were loaded, that is, for every partially loaded car hauled a mile, the roads of this group pulled an empty car a longer distance.

Dead Baggage. Fully to appreciate what this means, we should remember that modern freight cars weigh an average of 40,000 pounds, therefore, it is not uncommon to have from 1,000,000 to 2,000,000 pounds of this dead weight and baggage in a single train.



AN ENGINE OF THE SIXTIES.

The mileage of empty cars for the year ended June 30, 1908, was 5,153,180,753, equal to 46 per cent of the loaded car mileage. This amount is equivalent to hauling four solid trains of empty cars 25,000 miles long each around the earth each day.

Three-fourths, Top Notch. The highest proportion of loaded cars to the total haul which has ever been reached is 72 to the hundred. This was in a time of the greatest traffic congestion, the principal cause of car shortages. When one realizes that sometimes half the cars of the passing freight train are empty; that sometimes three out of five, but never more than three out of four are loaded, then one can understand better the unseen burden and expense falling on the Steam Roads in supplying us with rolling stock.

The Return of the Car. If we went to a livery stable to hire a rig to take us to a town 10 miles away, the charge made would include the cost of having the empty vehicle returned. In the case of the Rail Road the matter seems to assume an entirely different aspect. If a car is shipped for any distance from the line of one road to the line of another, the Rail Road along which the consignee lives bears the expense of returning the empty car, perhaps for hundreds of miles.

For every day that the car is upon its lines, the company returning it must pay 35 cents, and this expense must be made up from the freight rate received for transporting the goods originally contained in the car.

The loss on so much dead capital and the inconvenience in clogging the track, make empty cars undesirable, especially as the train crew and fixed charges on an empty train, except the cost of fuel and water, are practically as much as for the train which is carrying a normal load.

A Forced Expenditure. Every Rail Road in the United States pays 35 cents per diem for every "foreign" car on its tracks, for all days, Sundays included, except those days occupied in making repairs. While the time of repairs is not charged to the Rail Roads, yet, when the accident is of an ordinary character, they must be made free of cost, constituting another large item of expense.

The next time you see a freight train, or pass by a Rail Road

yard, count the number of freight cars belonging to other roads, and figure what the expense is to the company in whose yards you now see them, at 35 cents a day for each car. See what is the proportion of foreign cars to those of the parent road.

What It Means. If a car be on a road from six to ten days, which is the time frequently necessary before a foreign car can be returned, from $2.10 to $3.50 must be deducted at once from the Rail Road's pro rata of the freight charge paid by the shipper.

Terminal Lines Injured.

Terminal lines suffer particularly. As an instance, the New York, New Haven & Hartford gets a large number of cars from the West, designated for the manufacturing industries along its line. A large number of these cars are bound for local points, many of them within 100 miles of the point of delivery to the road, as against a total haul of perhaps 500 to 1,000 miles.

Terminal Losses. It requires some time for these cars to go through the usually crowded yards, and 6 or 8 days may elapse before the New Haven can get them unloaded and return them. In such cases, a very large proportion of the 10 per cent of the total freight haul charge which the New Haven receives, is a dead loss, and has to be deducted from its pro rata of the receipts.

When a shipper asks that a car be set on a siding for him, he should not forget that in case the Rail Road from which it is ordered has been very busy, as in the grain shipping season, it probably will not have a car of its own available. In that case, the road will have to furnish the patron with a car belonging to some foreign line. But while this foreign car is being loaded, the line on whose tracks it then is has to pay the owners 35 cents for each day it stands there, and this comes out of the home road's pro rata of the freight charge.

Shrewdness Applied. At the time of the depression there was a great deal of cross hauling of empty cars for the purpose of getting them off the roads paying the per diem charge for them. As the expense of moving them was considerable, and at a time when business failed to an extent of approximately $55,000,000 a month, it made a heavy drain on many roads, although others benefited to some extent. The various roads endeavored, meanwhile, to load only their own cars.

A Modern Passenger Train.

THE INTERNATIONAL MERCANTILE MARINE DOCKS, NEW YORK.

Unbalanced.

Every effort is being made by the Rail Roads to utilize empties and to haul as few of them as is possible, for this is only to their own benefit. But until we exactly balance our traffic and trade, ship as much bulky and special material from the east to the west and from the Gulf ports to the interior as now travels in the opposite direction, just so long will there be this drain upon their resources, this loss to the public in existing, but non-available transportation facilities, and the cost of hauling the empty equipment.

RAIL ROAD REBATES.

Their True Status.

The reader who has followed our story of progress and prosperity is, we believe, satisfied that the public carriers are distinctly and simply great business enterprises, specialists, if you like, with a single commodity, transportation, to sell. It is but logical, therefore, that in their commercial practices they proceed along the lines of other business houses. When buying large quantities of supplies they notify the trade that they are in the market for certain goods and invite competition. They place their orders with the merchants offering the best prices or discounts.

In times past when the large shippers or great merchants had hundreds or thousands of car loads of goods for shipment, they did practically the same thing. They invited the Rail Roads to compete for business, promising to place it where the lowest price or biggest discount from the list price—could be obtained. The shipper thus practically forced the granting of a rebate.

The Common Practice.

In many lines of business in the United States, the real prices which a merchant demands for his wares are not the sums appearing in his catalogue, for these figures merely serve as a basis from which certain deductions or discounts are made

For instance, one-inch, two-inch, and three-inch pipe are listed in the sales list of the hardware dealer at 16½, 36 and 75½ cents per foot, respectively, but as these prices were fixed long years ago, they are far above the present selling figures of the goods. Notwithstanding this, the original list prices are still adhered to, though only as a basis.

The Selling Price. To-day iron pipe can be bought from almost any mill or wholesaler at discounts which make the selling prices of the various sizes 3 6-10, 7 8-10, and 18 3-10 cents, respectively, instead of the figures quoted above, really only 20 to 25 cents on the dollar of list prices.

The writer has known bolts and nuts to be sold at discounts of 90 per cent, 10 per cent, 10 per cent and 5 per cent, or at about 7½ cents on the dollar of the list price. The series of discounts is the result of giving a certain discount for the purchase of a certain quantity; an additional discount is given for a larger quantity, and so on.

A Natural Transaction. The percentage of discounts is usually governed by the quantities purchased, and whether the buyer is a wholesaler, jobber, retailer, or consumer. The discount practice has made room for a host of middlemen, jobbers, commission merchants, retailers, dealers, and providers of our wants and necessities.

When you buy a single apple, you expect to pay a higher price proportionately than if you bought a bushel or a barrel.

Special Discounts. The catalogue of any wholesale house will disclose discounts which would astound the layman. He would learn from them that the large purchaser or dealer is able to buy for 25 to 40 and sometimes 50 per cent less than the retail price; in fact, the Department of Agriculture, which has made a study of the subject, finds an average difference of 38 per cent between the wholesale and retail prices.

Another reason for discounts is this: The catalogue price is made very high to cover any upward move in the cost of the commodity, which is liable to fluctuate considerably within the several years that an elaborate and therefore expensive catalogue is supposed to last.

The Rebate Practically a Discount.

Every business house considers discounts a legitimate part of its business, and on the letter heads of many firms are printed such notices as "Send for our list of discounts," "Special discounts," "2 per cent off for cash," etc. There are few modern wholesale houses, unless they are trust-controlled, who have one price for all their customers. On the other hand, business houses with "one price," consider it necessary to notify their customers that they give no discounts.

In mercantile circles it is a common thing for retailers to sell certain wares at discounts on particular days, commonly called bargain days. Wholesale houses give rebates to meet competition, in the form of reduced prices of certain commodities.

According to Webster. As our dictionaries give it, a discount is a sum to be deducted from an amount to be paid; anything counted off or deducted. In Rail Roading, discounts came to be called rebates.

Our dictionaries give another definition for rebate, namely, "a stick for beating mortar." Among Rail Roads it soon became

a stick for beating each other, and among the shippers a means of beating the Rail Roads.

A Recent Tale.

A recent example of a rebate for which a Rail Road was fined is the case of the Atchison, Topeka & Santa Fe Rail Road. This case and the fine imposed doubtless made many feel that rebates are still commonly granted. The facts were as follows:

Some years ago a beet sugar factory was projected in a semi-arid district on the line of this road. Only such products as beets could be grown successfully, the land being practically useless for other purposes. The construction of the factory, therefore, would have meant much to the Rail Road, the land owners, and the other people of that section.

Pro Bono Publico.

The local merchants, farmers and other public-spirited persons, for miles in every direction, got together and subscribed to the new industry. The Rail Road, as one of the prospective beneficiaries, was also called upon to contribute.

It is a question whether under its charter subscriptions from the Rail Road's cash resources were permissible. At any rate, the road agreed to subscribe in the form of drawbacks or allowances to the extent of $50,000 upon the freight bills for the transportation of the materials which were to enter into the construction and operation of this large factory. Rebates amounting to $11,000 had been allowed when the company was fined $7,000.

What the Rail Roads have been most severely censured for allowing is nothing more or less than the granting of discounts to large shippers, or buyers of transportation in large quantities. For many years it was a common practice, and regarded as legitimate.

Elementary Reasons.

Apart from those cases of granting rebates which arose from natural business conditions, let us consider a few of the extraordinary contingencies which spread the practice.

There have been many times since Steam Roads first began when they competed between two given points. At times of commercial depression the rivalry between the competing roads increased, and what were known as Rail Road wars resulted, in which the natural weapon was the rebate. Usually, the Steam Roads giving the largest rebates got the business and were sometimes saved when tottering on the edge of bankruptcy and receivership, while the others were forced into insolvency.

The Harm and the Good.

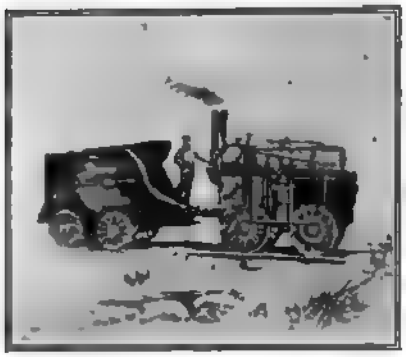
It is not probable that the Rail Roads had any overpowering innate desire to give rebates, any more than the average business man is anxious to make deductions from his asking prices. A rebate would be granted by a road when necessary to secure the business, because that brought a revenue which left at least a small profit, after deducting the rebate.

The practice of giving rebates grew to such an extent that even gentlemen's agreements on certain rates, entered into by the heads of Rail Roads were often violated and disregarded, sometimes

from the necessities of the properties and sometimes through the zeal of active young men, who were desirous of making records by securing business for their roads.

The Danger of Empty Cars.

A retired Rail Road president, who was very prominent 25 years ago, and who constructed one of our largest Rail Road systems, thereby building up a territory of greater extent than a dozen German principalities, told the writer that even during periods of depression, when the income of his road was so seriously affected that it was perilously near bankruptcy, it had a fairly large traffic in a certain direction.



Seguin's Primitive Locomotive.

Horses Drawing Railway Cars in a New York Station. 1860.

The cars in which the goods were shipped had to be hauled back for a long distance empty, and this not only resulted in an entire absence of revenue during the period they were being returned, but their return haulage involved a heavy expense.

Saved by Rebates.

To prevent this waste of equipment they searched for return loads for the empty cars. A steady traffic was secured in time, though at a price considerably below the printed rate. It yielded only a small profit, but did away with the haulage of "dead" cars at a loss. It created a new market for certain products of a distant section and virtually prevented the Rail Road from being ruined.

In many cases, rebates resulted from the necessity to make so low a rate as would enable some low-grade commodity to reach and successfully compete in a distant market.

Habit.

Such it is admitted to be by the Interstate Commerce Commission, which stated in a recent decision: "The case grew out of the long-standing practice intended primarily to develop trade."

A well-known Rail Road official explained a different phase of the rebate question: If a shipper furnished the cars himself, or would load a train load of cars, and the Rail Road had only to send up an engine to hook on to it, they could well afford to do the business cheaper, just as a truckman, if his trucks were loaded

and unloaded for him, would reduce his charges. A rebate was given in those cases because of the saving to the road in labor.

The History of Rebates.

Cheapness Resulted.

It was first the custom of the Rail Roads, just as in mercantile circles, to give discounts or rebates only to the big shippers, but in time the practice was extended to the shippers of medium sized quantities. As competition extended, the smaller shippers also were included in the list of those favored by discounts.

Then the largest shippers demanded further discounts; so did the others, and the charges thus established gradually came to be looked upon as the standard rates.

The Real Effect.

Many students of the subject believe that the practice of giving rebates has been the most important means and factor in bringing about our present minimum freight charges, the lowest on earth. In foreign countries, rebates are looked upon as a commercial requirement and in Germany a majority of the traffic moves under special rates. In England, rates are largely based on the volume of the shipments.

From the foregoing we would seem to find that rebating was not the result of any criminal design, or intent to build up any particular industry at the expense of another, but that it resulted because of ordinary trade rivalry and common practice.

Rebating Not Defended.

Rebates, in a broad way, are indefensible. They are undesirable, insofar as they place a tremendous lever in the hands of a Rail Road corporation or official, by means of which it is possible to work great harm and hardship to the small shipper. Or they enable a corporation or an individual to gain an undue advantage over another.

Rebates, however, compelled Rail Roads to practice the greatest economies, and forced them to adopt new methods to decrease the cost of operation, because of revenues lowered by them.

That the giving of rebates will be continued need not be feared, for it is obvious that no Rail Road is conducted in so unbusinesslike a way, that its managers will reduce its income voluntarily, by returning part of the revenue derived from transportation. One can readily understand that if there were several merchants in a town, each cutting the prices of the others, they would be very glad if a law were passed making this illegal.

Have You Done Likewise?

How many people are there who are not willing to get a rebate on what they are supposed to pay for their Rail Road fares, going to "scalpers" for the purpose of getting discounts upon their tickets?

Strange as it may seem, it is probable that the outcome of giving rebates has been the greatest good to the greatest number, and to a large degree this may offset the wrong done in those cases where the power of the rebate, unjustly applied, worked a hardship.

DIFFERENTIALS.

Their Service in Distributing Traffic.

Innovations.

Not long ago, an application was made to the Interstate Commerce Commission to permit one of the Rail Roads to grant freight rebates, or do one of the things which that commission is supposed to prevent! This seemingly audacious request probably was based on conditions something like those existing in connection with the passenger business between New York and Chicago, and between many other important points, the varying fares on different trains between these points being determined by the system of "differentials."

Between New York and Chicago there are many lines of Rail Roads, which vary greatly in length, some of them being approximately 200 miles longer than others.

We Prefer the Best.

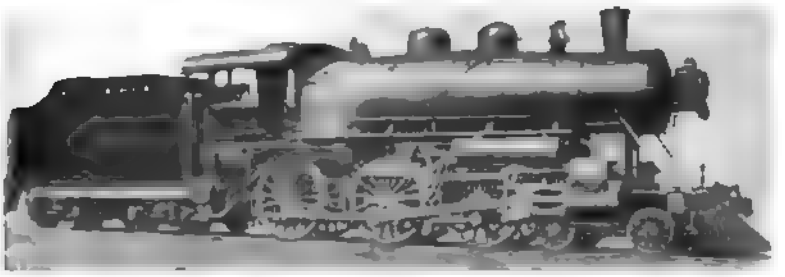
Because of their longer lines, slower trains and single track, it takes some roads from 28 to 30 hours to cover the distance with their best trains. Obviously, no traveler would use such lines if the fares were on a mileage basis, as he would be paying extra for the privilege of using up his time. Not even if the fares were equal, would the longer route be used by many people.

A minimum rate of $18 is fixed between New York and Chicago for a train which makes the run in 28 hours or more. For each saving of an hour of time, the faster Rail Roads charge the passenger $1.00 additional, so that the trip on the 18-hour train costs $10 more than the one on the 28-hour train, and in proportion between these extremes.

Paying for Time Saved.

As a result, people not in a hurry, and those who wish to travel cheaply, use the slower train and longer routes. Thus traffic is distributed, and under ordinary circumstances, each of the roads gets its reasonable proportion of through traffic.

The same general system of differentiating is necessary and desirable in the fixing of freight rates, for the better and double-tracked roads can move freight more quickly than the single-tracked ones, and they should be allowed to charge slightly higher



A Steam Horse.

rates for the more costly service, while the slower roads must have an opportunity for a percentage of the business.

Helping the Weak.

It would seem that either a rebate from established rates or a concession in some form or other, by roads physically, geographically or otherwise less favored than their neighbors, so as to give them a chance for a percentage of the business, would be a good plan, mutually advantageous to the Rail Roads and the public.

DEMURRAGE ON CARS.

One of the greatest drawbacks to the progress and prosperity of the country during times of great business activity is the delay caused by shippers wilfully or otherwise detaining cars for an unnecessarily long time in loading and unloading them.

Car Famine.

This has been one of the principal factors in creating the much-discussed car famine. Car famines may be largely avoided if every shipper would do his duty to his neighbor by loading and unloading cars with the utmost dispatch. In an endeavor to shorten the length of such delay by placing a penalty upon it, the Rail Roads charge the shippers "demurrage"—a certain sum per day for the use of cars after a reasonable time is allowed for loading or unloading, as the case may be.

Necessity.

If demurrage were not charged, many shippers would not use the regular warehouses. They would utilize the cars of the Rail Roads for the purpose of storing their wares, or for jobbing out from them, as we have frequently seen apples, potatoes, hay, oats or other produce sold direct from the cars, regardless of the Rail Roads' rights and the requirements of other shippers.

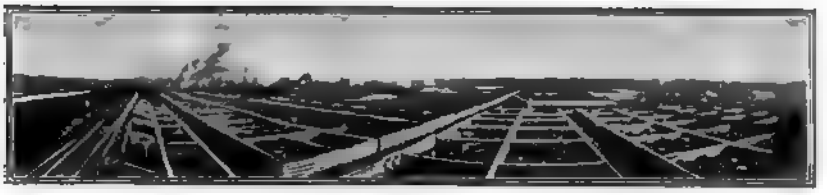
This detention of cars not only prevents an immediate use of them by others, but when the shipper or consignee has not his own "spur," also causes congestion of traffic in the yards or sidings, and interferes with the switching of the company.

Complaints from both roads and shippers have led some states to enact "reciprocal" demurrage laws. Under these the Rail Road is compelled to pay a penalty in case of its inability to supply cars within a given time after notice.

Demands on the Road.

But the practical application of this, as of many another apparently perfect theory, is not easy, nor is it always equitable. A Rail Road, under such a ruling, has to supply within a certain time any one or all of more than 20 kinds of cars, including coal, lumber, cattle, sheep, horse, furniture, tank, lime and refrigerator cars, as well as special cars of many other kinds, each one of which has to be ordered months ahead if it must be bought.

The only sum involved by the shipper is the money he has to spend for the unloading of the car, the labor for which can be secured under almost any conditions. Therefore, the demands upon



THE STOCK YARDS, ST. PAUL, MINN.

the Rail Road are very much greater than the requirements which have to be filled by the shipper in similar contingencies.

Arbitrary Ruling.

It is like demanding that a liveryman be fined for failing to have a phaeton ready when you want it, although he may have 20 other idle vehicles. The Rail Road from which the consignee receives a car must pay the per diem charge of 35 cents in case the car is from another road. This charge varies. In March, 1910, it was 30 cents. From August 1, 1910, to March 1, 1911, a 35-cent rate ruled, after which date it was again 30 cents.

Rolling stock may be tied up because elevator and dock facilities are inadequate, so that prompt unloading is simply impossible; congested terminals may also delay switching and delivery.

Bumper Crops Cause Shortage.

Business conditions often take a major part of the cars from a road at once, without immediately returning more than a small number of them. Thus, in the crop-shipping season, grain cars from Western roads go East by thousands, for a distance of a thousand miles or more, but they return only in driblets and by hundreds, and even in these quantities after intervals of perhaps weeks of absence.

Difficulties in Supplying Facilities.

Mention should also be made of the difficulty of determining beforehand what the crops and industrial conditions and the consequent requirements for transportation facilities will be.

Did you ever stop to think how cars go from one road to another with no great interest on the part of the receiving road to return them in a reasonable time, and how this affects the ability of the Rail Road to furnish cars of some particular class?

Thy Wares Are My Wares.

Suppose our liveryman were compelled to furnish a wagon to anybody demanding it, although the person hiring it informs him that it would be sent to a destination 2,000 or 3,000 miles away, passing through a score of states, half a dozen other livery establishments and some hundreds of strange hands, and would be returned to the liveryman at the convenience and pleasure of somebody else. Yet this happens to Rail Roads and their cars every day in the year.

The troubles of the transportation company are further increased by the shipper, who orders cars not needed, to prepare himself for a possible emergency.

Lack of Cars a Loss.

Ray Morris, a well-known authority, says what is obvious—that a Rail Road gains nothing by failure to furnish cars when there is freight to be carried; it lives by carrying, and the greater the loads which it carries, the larger its income.

"Therefore," Mr. Morris reasons, "in cases where the interest of shipper and of the road are identical, a reciprocal demurrage law imposes a penalty for failure to perform the impossible."

Sold Out.

Has the reader ever gone to a livery stable to hire a rig, and found all the vehicles engaged? to the butcher shop for a favorite cut of meat, to find that an earlier customer had carried it away? to the theatre and been told that all the choice seats were gone? to a bargain store to find that the special thing wanted had been sold out?

All of us have had some of these experiences, and while perhaps annoyed, did we demand an indemnity from the liveryman, the butcher, the ticket seller, or the merchant, for his inability to foresee our desire, and because his business was so good that his wares were already disposed of or in use?

With Justice for All.

Are we following ordinary practices when we propose that of all commercial institutions one certain business shall be heavily fned if it does not place at our disposal a facility of a special and expensive kind, so many hours after it is ordered?

Our public carriers have made every endeavor to meet such contingencies. Previous to the panic, it was impossible to get a car built, even when it was ordered 12 months ahead. There were 284,188 cars, capable of holding 10,000,000 tons at a time, constructed in 1907; curtailment only came during the period of the financial depression.

More Adjustment Needed.

In view of existing conditions, under which freight cars really serve only from 150 to 200 days a year; whereas every day of idleness for 100 cars means idleness of $100,000 of capital, plus the cost of depreciation, which exceeds the interest account; in view of the fact that trade often carries cars far away from a road without returning them, and that shippers, consignees and terminal companies, by their delays, deprive the roads of the use of a number of cars—weighing these facts it seems fair to concede that the penalizing enactment of reciprocal demurrage may bear upon the roads heavily and with inequality apparently out of harmony with a proper measure of fairness.

A HEAD-ON COLLISION, INDIA.

SECTION XXIX.

FACTS ABOUT RAIL ROAD ACCIDENTS.

Preservation. The study we have made, makes it apparent that progress and prosperity require the moving of men and goods, and a very important factor is the safety with which they are moved. Therefore, we will look into the dangers of movement on the Iron Road, in our great cities, and in our daily routine throughout the country.

One of the misfortunes of Rail Roading which causes much ill-will, but for the lessening of which much is being done, is the occurrence of accidents. In order to prevent them and to make safer this type of the vehicle of progress and prosperity, many changes and improvements already have been made.

Record of Accidents. That we have made great progress in the safety of our travel, is proven by the official reports and bulletins of the Interstate Commerce Commission. There were 131 passengers and 520 employes killed in train accidents in 1909, as compared with 410 passengers and 1,011 employes, in the fiscal year ended June 30, 1907. There were 68 per cent fewer fatalities to passengers and 48 per cent fewer to employes in 1909 than in 1906-1907.

The Greater Safety To-day. In 20 years from the establishment of the Interstate Commerce Commission, there was a decrease of more than six per cent in fatalities to passengers, against an increase in passengers carried one

mile of over 142 per cent; there was an increase of only 2.9 per cent in fatalities to employes against an increase in tons of freight carried one mile of 200 per cent, and of almost 100 per cent in the number of employes.

In the total number of fatal accidents, there was an increase of 24 per cent against an increase in the traffic and in number of employes averaging over 100 per cent.

AN INSPECTION TRIP

In other words, the Rail Roads decreased the proportion of fatalities to their operation 75 per cent.

New York's Accidents.

In interesting contrast is a recent report of the New York City department of health. This shows that in that year there were killed by accident in the city of New York 2,916 persons, equal to 5 per cent of the 79,205 deaths in the city, and representing 98 of each 100,000 of its population.

In proportion to population, therefore, the accidental deaths in New York City were 245 times greater than the Rail Road fatalities to passengers of the entire country for 1909, for the latter constituted less than four persons to each million of the country's people. Fatal accidents to employes, however, numbered 2,456.

Fewer Fatalities.

The decrease in fatalities was common to all classes of Rail Way accidents, but was greatest in deaths resulting from train accidents, "with which," to quote Prof. Henry C. Adams, the official statistician of the Commission, "Rail Way transportation is primarily concerned."

The number of people killed fades almost into insignificance when we consider that in 1909, passengers were carried one mile to the extent of almost 30,000,000,000, or on an average, every person in the United States was carried more than a mile every week day.

The most important part of the story of fatal accidents, or rather of the lessening danger of modern transportation, is contained in a résumé of the proportion of passengers killed to those transported.

In 1907 a passenger was killed to 72,802,000 carried one mile, while in 1909 only one passenger was killed to 288,745,000 carried the same distance, so that travel to-day would seem to be four times as safe as it was two years ago.

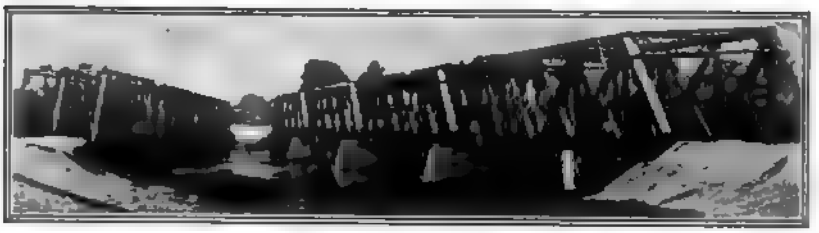
Greater Safety.

In 1889, when the Commission's statistics first assumed comparable shape, there were reported 161 fatalities to passengers in train accidents against a passenger mileage of 11,553,820,445, or one per 71,762,859 passengers carried a mile.

A man would have to travel around the earth at the equator 11,550 times before he would reach his average for a fatal accident. Assuming he traveled at the same speed as Phineas Fogg, making a trip around the world in 80 days, he would be about 2,600 years old, or he could have been born 600 years before the Christian era, doing nothing but traveling by modern methods, and would be living yet.

Danger Small.

At the rate of the average American's travels, about 320 miles a year, he would be nearly a million years, or to be correct, 902,075 years old, the combined age of a thousand Methuselahs, before, as the result of a Rail Way accident, it came to his turn to be gathered to his fathers.



AN ABANDONED BRIDGE AND ITS HEAVIER AND STRONGER SUCCESSOR.

It has been estimated that less than one-sixth of our fatalities are due to accidents which could be prevented by the adoption of the block signal system by all the Steam Roads of the country, which, assuming that every piece of apparatus worked faultlessly, absolutely precludes the possibility of collision.

What and Who Causes Them.

The extent to which accidents are caused by personal carelessness, may be realized when we know that if casualties were divided between those due to causes beyond control of the Rail Roads, and those due to the negligence of the persons involved themselves, as they are in Australia, "it would be found that Rail Ways are responsible for only 42½ per cent, or four out of 10 of the passengers killed, and 60 per cent of the injured, and for 23½ per cent, or less than one out of four, of the employes killed, and only 13½ per cent of those injured."

The Many Contingencies of the Steam Carrier.

The Moving House.

In another chapter, Rail Road cars are compared very properly with houses. Suppose nearly two and a quarter million residences, barns and storehouses in the United States, instead of standing quietly on their foundations were to be rushed all over the country on our roads, at a speed of from 15 to 60 miles an hour, stopped, started, shifted, and side-tracked hundreds of times each, packed together into rows, pulled apart, that is, coupled and uncoupled, with people in many of them, we would naturally expect a very large number of accidents.

Highway Accidents.

If you have never considered the frailty of wagons of all kinds, even the strongest, the next time you drive a long distance over a country road, see how many wrecks of broken-down vehicles you will find along the roadside. Can you remember how, on many days when you have taken a long walk in the city you saw a horse down, a truck with the wheel off, a carriage damaged or some other evidence of an accident to rolling stock?

You doubtless know a number of persons who have been injured by runaways, the wrecking of vehicles due to the breaking of a trace, harness, axle, or wheel or to some equally simple cause.

Get a Horse.

As for automobiles, we are so accustomed to hearing the sarcastic suggestion "get a horse," that we cease to notice their misfortunes, although, as a matter of fact, these are becoming much less frequent, owing to the perfection at which the mechanism of these machines has arrived.

Accidents cannot always be guarded against. There are weaknesses caused by usage, and flaws which cannot be detected by the most careful examination. To even a greater extent is this true of our Rail Roads and their equipment.

Roughly speaking, the accidents on Rail Roads have been reduced to three causes: First, derailment; second, collision; third, and most frequent, the breakage of some part of the train gear.

The Numerous Chances.

As is stated elsewhere, the number of Rail Road spikes in the United States, holding down the rails to the ties, is more than 32 times as great as the known stars. Bolts holding the rails together at the joint or fish plate, likewise outnumber the stars. The number of rails in our Rail Roads is approximately 110,000,000; or 160 feet of rail, and five breaks therein, where they are connected by joints, for each four people in the United States, every inch of which may contain some hidden flaw.

There are 2,250,000 cars and 57,000 iron horses. There are, in round numbers, 20,000,000 wheels, 10,000,000 axles, 10,000,000 boxes, 20,000,000 brake shoes, 10,000,000 brake beams, 5,000,000 couplers, and millions upon millions of other mechanical parts, every one of which is subject to wrong usage by the men engaged on the Steam Roads, to mechanical contingencies, metallic weakness or other fallibility.

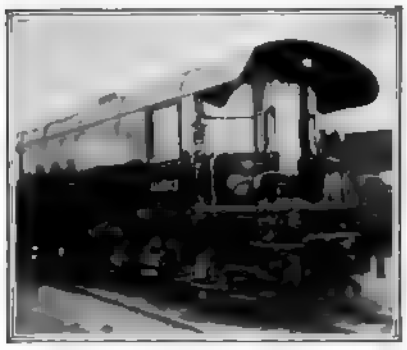
Watches and Clocks.

Watches and clocks are made with the utmost care within a small, easily controllable space; compared with the work they are intended to do, of actuating only a delicate little balance wheel and its governing mechanism, their strength is as carefully calculated to do their work without interruption as the Rail Road locomotive which hauls thousands of tons. Yet, notwithstanding that the clock stands quietly upon our mantelpiece and great care is taken of it, as of the watch in our pocket, it still develops sudden weakness and gets out or order, the spring breaks, or something else happens to make it stop.

The Man of Iron.

The locomotive is fairly comparable in delicacy and in variety of parts to the human body, and its physiology requires scarcely less attention. It seems logical, therefore, that the engine, like the human machine, has its sick days and gets out of order for no explained or appreciable reason. and has its share of injuries and breakdowns.

INTERIOR, ELECTRIC LOCOMOTIVE



A PENN ELECTRIC LOCOMOTIVE

Accidents Will Happen.

Many accidents are practically unavoidable, occurring unexpectedly under any and all circumstances. A prominent insurance company reports that more than 500,000 persons are killed or severely injured annually by accidents in the United States A person dies from injuries received in accidents every nine minutes. One person out of every five is injured during each year.

Do you know many people who have gone eight years without a disabling accident? This proportion means 11,000,000 accidents per year in the United States.

A Small Percentage.

That accidents on Rail Roads are not more numerous nor more to be dreaded than others would appear to be proven perhaps by the following table, prepared by the Travelers' Insurance Company, of

Hartford

	Per Cent.
Accidents to pedestrians	24.14
At home (indoors)	18.80
Horses and vehicles	18.16
At home (outside)	15.98
Recreation	6.15
Rail Road travel	4.77
Bicycle accidents	4.06
Street car travel	2.74
Use of firearms	1.73
Animal bites	1.52
Assaults	1.20
Steamship travel	.70
Miscellaneous	.05
	100.00

Safer Than Homestaying. Five times as many accidents, therefore, occur to persons walking as to those who use the Rail Road; four times as many are injured at home indoors, as through Rail Way travel, and three times as many people are hurt by staying in the grounds of their houses as by traveling on Rail Roads.

The deduction therefore appears that Rail Way travel is safer even than shutting oneself within one's home.

More people than are injured by Rail Ways meet with accidents while seeking recreation; bicycle accidents nearly equal those caused by Rail Roads, and fully one-third as many people suffer from animal bites as from Rail Road accidents.

Accidents Numerous. As an evidence that accidents cause a considerable portion of the total of deaths, it may be noted that 7.7 per cent of the death losses paid by this great insurance company, between 1897 and 1901, upon its straight life business, were the result of accidents; this percentage had increased by 1905 to 11.1 per cent.

Of the ordinary policyholders of this company, one in eight sustains disabling injuries and one in 621 meets with fatal injuries.

The Human Element.

The Personal Equation. The protection of human life is the thought uppermost in the mind of every transportation man on duty, from the highest to the lowest. Few engineers are reckless. The most heinous crime on the part of any Rail Road employe is that of carelessness which may endanger life, and it is promptly and severely punished.

The Engineer. Much responsibility naturally rests upon the engineer, and for this reason the greatest care is exercised in his selection. It should be quite comforting to nervous people to realize that out of every 100 who enter the service in the firing department, only 15 become engineers,

A SHOP FORCE ON A MODERN ROCK ISLAND ENGINE.

and only five of this number become engineers of passenger locomotives.

That is to say, every passenger engineer is the selected man from among 20. He is thoroughly trained to meet every emergency. His efficiency is as carefully looked after as that of anything upon the Rail Road; he has to undergo constant examinations, particularly of his eyesight.

A Matter of Importance.

It should be remembered that there is a very good reason why the engineer is not inclined to be reckless and that is the jeopardy in which he places his own life, as well as those of his passengers. It is difficult to find a more decided incentive to care than self-preservation. As he is in the front of the "firing line," he is in the most dangerous position and usually one of the first to be hurt.

The speed at which he may run his engine is carefully limited on many roads. Besides, he knows his tracks, his curves, his crossings and his switches as one knows the furniture in one's bedroom.

Other Protectors.

The engineer, of course, is not the only one upon whom devolves the sacred duty of caring for human lives. The fireman is constantly on the lookout; the conductor is on the alert; the brakeman and all other employes see to it that the rule of eternal vigilance is not violated

Few trains in the United States, except the long-established trains with standing orders, go out upon their routes without each receiving a train order; usually a number of such orders are received in covering each division

Train Orders.

Freight trains, particularly, move almost entirely under train orders and the great rail service therefore necessitates millions upon millions of Rail Road orders annually It is the magnitude of precaution which brings in its wake a considerable proportion of the accidents. In view of their number, is it any wonder that some of the orders are misinterpreted, bungled or in some way miscarried?

Many of us, in the routine of public and private life, have given most specific and detailed instructions, even in writing, only to find

that the person who was to carry them out utterly failed to do so.

Human Weakness.

Taking human fallibility into consideration, is it any wonder that there are, and very likely always will be, accidents in connection with transportation operation? In our personal affairs, when our instructions are not intelligently executed, the fact does not impress itself strongly on our minds, for it is an ordinary occurrence and the bungling usually affects us in a comparatively trifling manner. But in almost every case of Rail Road orders, life and death are involved, as well as the safety of vast property values, and, therefore, the accident impresses itself on us very strongly.

Unpreventable Accidents.

Rail Road accidents cannot always be traced to definite causes. The writer remembers very well, on one occasion, coming down a mountainside, approaching a Rail Road. A freight train was passing, at an ordinary rate of speed, and as he was looking at it, something suddenly happened in the center of the train; the cars turned somersaults and piled up, as a set of toy blocks knocked over by a child in anger.

There was no apparent reason for the accident. The track and the running gear of the train were apparently intact even after the wreck, and careful examination failed to discover any tenable explanation for the accident.

Simple Cause.

On another occasion, when traveling in Missouri, the writer saw several cars wrecked by the breaking in two of a freight train, through the pulling out of a draw head when the train was ascending a stiff grade. The cars which broke loose ran back and struck the second section of the train, which was following, just as the latter was passing across an embankment 20 to 30 feet high. A number of the cars were derailed, rolling to the bottom.

The Contents.

The boxes and packages in the cars were nearly all broken open and displayed a startling variety of contents. The universal service of our Rail Roads was well illustrated. There were candies, coffee, teas, sugars, almost a complete stock of groceries and canned goods, sauces and pickles, corsets, millinery, underwear, hats, artificial flowers, a complete stock of boots, shoes and rubbers for both sexes and all ages, guns, pistols, cartridges, powder and shot, music and books, pianos,

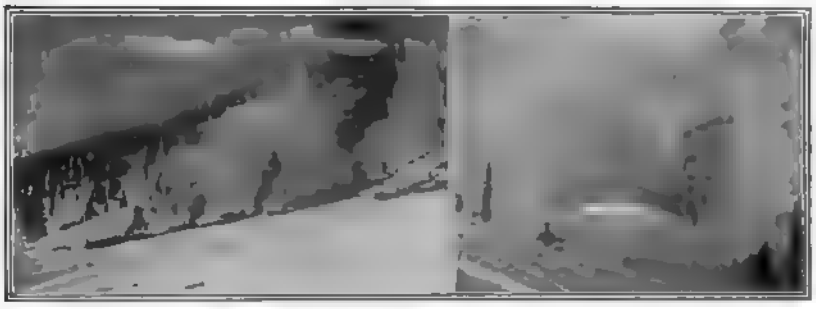
More Contents.

children's wear, hardware of almost every variety, including nails and spikes, cutlery, plows, and small agricultural implements, stationery, cakes, drugs, a crated buggy, dry goods and notions, cottons and woolens and so on almost ad infinitum, including an organ, an undertaker's outfit and man's last overcoat—a coffin. Fortunately the last was not required, for no one was killed, or even injured. There was a car load of coal, another of live stock and one of lumber.

Hash.

Taken as a whole, it was as complete a representative hash of the products of mankind as one could well find. The wreck was caused by the giving way of a comparatively small piece of iron concealed in the

draft gear of a freight car, an accident no amount of vigilance or care could have prevented beyond peradventure, yet it caused the almost complete loss of a number of cars and their contents by wrecking them.



FIGHTING SNOW WITH ROTARY SNOW PLOWS.

The Tramp Menace.

Trespassing.

Our Rail Roads are unfortunately the highways of vagrants, of the unemployed, of mischievous boys who jump on trains and ride until the speed grows dangerous, of young men going from town to town, and many others who choose to travel on foot along their lines.

In England no one would for a moment think of using a Rail Road track as a public highway any more than of using a private garden for that purpose. In England trespassers on Rail Road property are punished as severely as trespassers on other private property. If our legislatures would pass and the authorities enforce a law of drastic nature against this abuse, it would be of inestimable value in the decrease of the total of Rail Road accidents.

Insulted Vagabond.

Tramps consider the Rail Road a personal convenience, and will go to almost any length to prove this belief. An angry or disgruntled tramp forcibly ejected from a train, frequently seeks revenge by drawing spikes, tampering with a switch, or placing an obstruction on the track.

So great is the apprehension felt by the Rail Roads for such persons that when on the Union Pacific, for instance, a tramp is found on a train between Reno, Nevada, and Blue Canyon at the top of the mountains, where there are some 40 miles of snow sheds, costing millions, he is carried past this section, for fear he might set fire to these valuable adjuncts to Rail Road travel if ejected near them

Nerve.

Try as the Rail Roads may to suppress these nuisances, the "hoboes" increase in audacity and numbers. It is not unusual for a gang of tramps to take practical possession of a freight train by main force, rendering the train crew helpless to carry out the orders of the company as to their ejection If the Rail Road tries to prosecute, the average

rural magistrate usually disposes of the case by giving the tramp a sufficient number of hours to leave the town or county, which frequently the latter proceeds to do by resuming his journey over the Rail Road. This is done to save the local authorities the cost of incarcerating and feeding the prisoner.

Safety and Congestion.

We have seen the congestion in great department stores at Christmas time, and know the difficulties of transacting business smoothly under such conditions. For many years the congestion of traffic on our Rail Roads has added greatly to the difficulties of handling it safely.

No Safer in England.

Contrary to popular impression, Rail Road travel is as safe in the United States as in England, when the difference in mileage, the greater danger in single track as compared with their almost universal double tracks, and our mountainous country, are taken into consideration.

In one year in England, the Rail Roads did not kill anyone; the next year the fatalities in a single wreck resulted in the same annual average as in this country.

On 347 American roads, representing 159,000 miles of line, not a single passenger was killed in a train accident in 1909. This is five times the entire Rail Road mileage of Great Britain.

Notwithstanding the greater danger of men engaged in Rail Roading, insurance companies charge passenger train conductors little, if any more, for life insurance than they do the average individual; and practically as many Rail Roaders as men in other walks of life, die of old age.

Taking Risks.

While the accidental deaths of Rail Road employes are occasioned, in many instances, by the hazardous nature of their occupation, they are caused to a far greater extent by the carelessness and callousness of the employes themselves.

The writer well remembers that in the days before automatic couplers, brakemen on many Rail Roads were furnished with sticks to guide the coupling link. These were almost always thrown away, the brakemen priding themselves on their skill in making the coupling with their hands; their bravado often caused severe injuries.

If one is desirous of getting heart failure, it is only necessary to go into the average freight yard and watch the men in the shifting and shunting crews, as they coolly step between the rails in front of approaching shifting engines, moving at a speed of from four to eight miles an hour, and, lifting one foot, step on the running boards in front.

Heart Failure.

If the heel of a shoe were to come off, an ankle to turn, a piece of ballast to rock, if the step were ill-timed or too low, the man "doing the trick" would probably be ground to death under the locomotive, and no

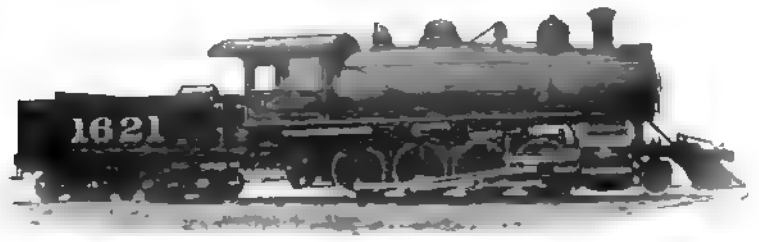
action on the part of the engineer could save him. Yet this unnecessary risk is taken thousands and thousands of times daily, and is only one of a hundred species of carelessness practiced by Rail Road men.

Damages.

It is computed that the total loss to Rail Roads through accidents to property alone, is $35,000,000 per annum, while injuries to persons cost about $20,000,000; the cleaning up of wrecks, etc., caused an addition of probably $3,000,000 to the expense. In round numbers, the cost to Rail Roads is $60,000,000 per annum.

Stock Killed. Accidents to animals are largely unavoidable. The laws of practically all our states compel tracks to be fenced, but whatever vigilance may be exercised, animals will wander from home and break down or force their way through fences, or by other means get upon the tracks. The Rail Road is usually the sufferer by this, as it nearly always is compelled to pay; and in order to get the most damages, the owner is likely to rate the breeding of the animal as high as possible.

The popular saying that "a cross between a cow and a locomotive makes the most valuable and expensive animal that can be bred," has in it more truth than humor.



EVEN THE HEAVIEST LOCOMOTIVE COULD EASILY BE DERAILED BY AN ANIMAL ON THE TRACK.

The owner's loss can be easily made good; but when the Rail Road equipment is injured, it is quite a different matter. A hog, steer, or cow rolled under the trucks, may fling a swift passenger or heavy freight train from the track, making scrap iron of an engine worth a thousand fat hogs, and wrecking half a dozen coaches, each as valuable as the farm that proved too small for the animal's range.

The Moral Effect. The material damages occasioned by a serious accident are only an incident as compared with the delays to traffic and general disarrangement of Rail Way schedules. In addition, every accident lowers the standing of the Rail Road, has an effect on passenger travel, and casts its shadow on the directors, officials, employes and stockholders.

Dangers of City Life.

Death Waits Everywhere.

An interesting comparison with the number of accidents in this industry, full of risks and dangers, is furnished by the New York City department of health report, already referred to. This report covers only fatalities, no account being kept of disabling or minor injuries. But it shows that 126 persons, or five less than were killed while riding as passengers on all the Rail Roads of the United States in 1909, met death in one year from tumbling down stairs, and almost six times as many, or 745, were killed by falls on the streets, through elevator shafts, into excavations, or from buildings.

The number of those burned or scalded to death reached 443, and 455 others were crushed to death in various ways. Sunstroke killed 79 hapless ones, and 436 persons were accidentally drowned. Rabid dogs caused the death from hydrophobia of 28 persons. The accurate death statistics of New York City thus show that in proportion to population probably more than three times as many persons die of hydrophobia as passengers from train accidents. Thirty-six persons died from coming into contact with electric wires or electrically charged bodies.

Street Car Dangers.

We do not hear so much of the dangers of street car traffic, yet 516 persons were killed in New York City in 1907 by the horse and electric surface cars, and elevated and subway trains. Street vehicles caused the death of 380, of whom 278 were run over.

Strange as it may seem, after examining the several reports referred to, one wonders whether it may not be best to seek safety from street and home perils by traveling on Steam Roads for the rest of one's life.

One may form one's opinion as to whether, in view of the speed with which the intricate movement of human beings and freight is effected, statistics of Rail Road accidents do not form a most creditable record.

PRECAUTIONS TAKEN WITH ROADBED AND ROLLING STOCK TO GUARD AGAINST ACCIDENTS.

Visitations of Providence.

Unforeseen accidents occur on Rail Roads, but earthquakes and cloud bursts do not give preliminary notice, either. Nor would one accuse Providence of wilful negligence when, in the "scheme of things entire," there happens some great catastrophe. It is only when pigmy man and his systems fail, that condemnation seems to be in order.

The writer does not believe that any attribute of sympathy or care for human life will be found lacking in the average Rail Road man. By night and by day the Rail Roads are striving unceasingly to prevent accidents.

Inspection. Track is inspected. Cars and equipment are tested. Men and signals are set to safeguard passengers and trains. The tap-tap of hammer against car wheel at every important station, means that men with trained ears are testing the wheels and searching for crack or flaw.

Not every road can afford to give the best protection, it is true, any more than every man can afford to build a fireproof house with sanitary plumbing and all modern improvements and conveniences. According to his means, a man will insure himself and his family against danger; and according to their means the roads of the country endeavor to safeguard and insure their lines and the valuable and precious burdens entrusted to their care.

A Dependable Road Bed. The safety of equipment, load, employes, and passengers, depends in a great measure on the safety of road bed and tracks. Consequently a great deal of care is taken to maintain this constantly in the highest state of efficiency.

A WELD BURNER

Many unfavorably compare the American with the British road bed. We could not afford to build so substantially as is done "across the pond." Many of our Rail Roads run great distances through sparsely settled districts, where traffic is light, construction materials not available and the revenue low. In fact, as we show elsewhere, the British Rail Ways take in two and a half times as much as ours do, per route mile. Might it not, with equal justice, be asked why every ordinary country road is not asphalted, Belgian blocked, or wood paved, as are the streets in great cities, and why fences are not put on either side, where there are fills or dangerous spots?

If we had the English capitalization, the interest alone would eat up more than is earned by our roads, leaving nothing for wages, operating expenses or maintenance.

Drainage. A firm foundation is the fundamental consideration in the construction of road bed. This calls for adequate drainage, as even on level ground running or high water may cut away loose soil and endanger the track. On a line having many cuts or fills, the danger is increased. Particularly perilous also is the hidden spring or underground stream that cuts a subterranean passage, yet leaves the surface apparently firm.

Extensive engineering work is often necessary to protect sections of the road bed. Ditches must be opened, channels guttered, walls built against bordering streams, exposed banks riprapped, and landslides in deep cuts or along mountain sides guarded against.

Culverts. Culverts, by which is meant all undertrack passages less than 12 feet wide, are intended primarily to allow the escape of water. They increase danger, because the water often wears holes and creeps through or behind them, undermining the track.

Even a little channel thus cut may cause disaster in case of heavy rainfall. The rush of the full stream may enlarge it to such a degree as to leave the ties and rails practically unsupported.

Bridges. Bridges call for no less care and for great engineering skill in superstructure and foundation. The latter must be absolutely firm, and the piers, abutments and approaches must be strong enough to withstand the onrush of great volumes of water and sometimes of ice. It is frequently impossible to find a firm natural base for the foundations. At such times, artificial bases, such as piles and pneumatic foundations, are sunk to considerable depths.

The ties are carefully inspected and selected with great care. The best woods are cypress, oak, cedar, chestnut and pine. A register is kept in which the condition of every tie is set down; all are inspected regularly and a suspected tie daily.

Rails. Both before and after they are laid, the rails are closely scrutinized. Modern chemistry has expended its best efforts to develop rails of the strongest, most indestructible sort, and workmen of the highest skill roll them. But, notwithstanding all care, a rail may have a flaw—a chemical defect or a crack—and thus every precaution may prove to have been in vain.

The spikes, plates, nuts and bolts used in laying rails likewise are subjected to great care in manufacture, and to close scrutiny while in use upon the road.

Great Strain. The great strain upon them is indicated by the fact that on the outside of curves thick braces of wrought steel sometimes are sheared clean off by the pressure of the rail base against them. This accident occurs even though, on curves, the outer rail is raised, which makes the stress little more than that upon a straight track and reduces the impact of the train against it.

The Westinghouse Airbrake and other shops.

Constant Watchfulness.

But the care exercised in selecting materials, preparing the road, building the superstructure and in looking after their proper maintenance, would be useless if it were not continuous. Eternal vigilance is the price of safety, and if for any earthly affair the all-seeing eye is a fit symbol it is so for Rail Roading.

Watchfulness. Not less than once a year the general superintendent travels over every division. The train dispatcher goes over his 100 miles of line once in every two weeks; the supervisor, the section gang and the boss travel their sections daily; track-walkers scan every yard of track at least twice a day, while at times a night track-walker patrols the road in addition.

A conductor who thinks he detects something wrong with the track—noting an unusual click or rattle, feeling a jar or seeing something amiss—reports it at once. Engineers, telegraphers, station agents and others do the same.

Precaution. Rails are scanned, joints examined; the condition of the spikes and ties is watched; the girders and sills of bridges and culverts are tested; the vibration of viaducts is noted; search is made for seeps and washes in the road bed.

Most careful study is made of types of rolling stock, and of safety devices. One of the most important of recent improvements in cars is the substitution of metal for wood. Steel cars are already widely used, and where only a surface and not strength is necessary, aluminum may come into some use. The metal car has great advantages, in that it is elastic, and does not splinter, buckle, telescope or burn, except in extreme cases.

Airbrakes. The adoption of airbrakes greatly lessened the danger from collision and of rushing into obstructions on the track. Any passenger train can be stopped practically within its own length.

The use of automatic couplers lessens danger to trainmen, holds the cars more firmly against telescoping, and largely prevents the breaking in two of trains.

Inspection. Derailment usually is the result of a defect in running gear, to prevent which repeated inspection is enforced. Car, truck, axle and journal boxes are carefully examined, and if anything is wrong the car not in perfect condition is cut out of the train.

Hot boxes are a source not only of grave annoyance and delay to trains, but of great danger. If boxes are not turned with the utmost accuracy, if the brass is a trifle rough, or if some sand should get into the journal box, friction is likely to result. The writer has seen a journal red-hot from this friction, and has been on a train when a journal on the pony truck of a locomotive heated up and ground off, the wheel rolling under the train.

On the best roads brake gear, draft gear, everything underneath the train, is examined at the end of each division. The air-

brakes are carefully tested. Besides, the engineer gets down from his cab at practically every opportunity and examines his engine.

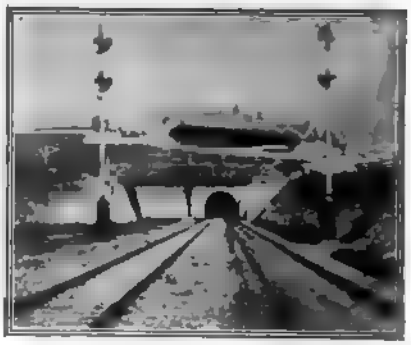
The Proper Attitude.

A. H. Smith, general manager of the New York Central, says: "We have reached the ideal state, if I may so term it, of our sense of obligation to the public, that is never in friction with expenditure, if that expenditure can give additional safety.

"After all, we are only hirelings and servants of the public. We are never in that state of peace with the world that we can afford to forget it. Safety is an axiom that in every phase of Rail Road operation is never allowed to be forgotten."

SAMUEL F. B. MORSE, INVENTOR OF THE TELEGRAPH.

BLOCK SIGNALS AT A TUNNEL ENTRANCE.



Signals.

Safeguarding Life and Line.

Precautions looking to perfection in rolling stock, road bed and track are insufficient without constant vigilance over every detail of operation.

A system of varied, unremitting warning is in force on every Rail Road. Torpedo and colored fire; lantern headlight and tail-light; semaphore light and the red, green or white flag, the colored ball, switch pointer or lamp, the telegraph message, whistle blast and hand signal, and the automatic bell, switch, signal-set and emergency train stop—all of these in the list of constant safeguards of trains show how complete is the system of protection in force.

Beacons of the Rail Roads.

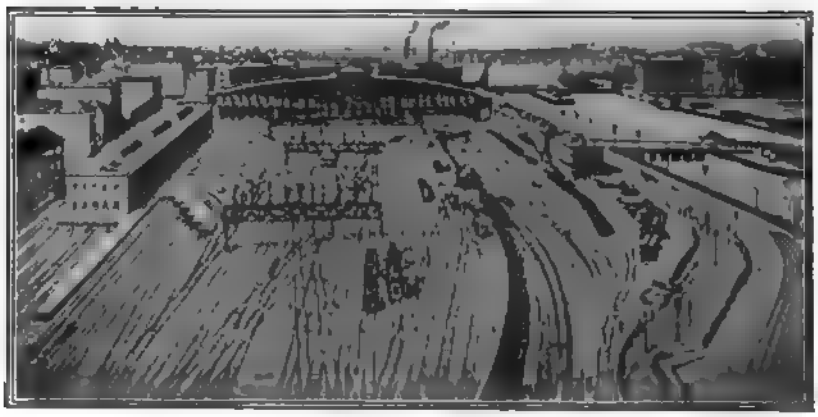
A poet has sung of the "lights along the shore," but as yet none has praised the lights along the line that nightly guide hundreds to safety where the beacons of the sea guide one. Wherever there is a switch, a "Y," or a spur, the red and green lights of the switch lamps shine by night, where by day show the solid red and white of the switch pointer and shield. The red light gives warning of an open switch; the green gives assurance of a clear track.

The Rail Road Fairyland.

The large Rail Way yards by night teem with almost romantic interest. In a hundred places red switch lamp targets show; in a hundred others gleam the green or white. Overhead the semaphore lights break out in ones and twos and threes, now red, now green, now red and orange, now red and green. White cones of electrical headlights bore into the dark; the red glare from an opened furnace door falls athwart white steam in softened crimson or violet, and down the distance the blood-colored tail-lights of outgoing trains switch jerkily from track to track, dwindle, and disappear into the blackness.

Lantern and Hand Signal.

Less picturesque, but no less indispensable, are the signals given by hand or lantern—the one in daytime, the other at night. On a long train three or four trainmen are required sometimes to pass signals from the rear of the train to the engineer; at night, fewer can do this than in daytime, for lantern signals are visible farther. No system of electric signaling to the engineer from the ground or the top of a freight train has yet been devised and put into use.



TRACKS ENTERING SOUTH STATION, BOSTON

Flag signals from the ground are in the same class as hand and lantern signals. One of the most familiar forms is that at grade crossings where crossing guards or gatemen signal back teams and pedestrians with a red flag, while indicating "clear way" to the engineer with a white flag displayed across the tracks or waved, pointer like, down the line.

The same white flag is used to signal "come ahead" to crossers when the tracks have been cleared.

Doubling Safeguards.

Flags and lanterns are also used as signals to stop other trains when unscheduled or unusually long stops are made. In such cases, the rear brakeman must go back a quarter of a mile or more to signal any train which may approach. This is the practice even when

block signals are in use, as nothing is left to the element of chance, and precautions are doubled wherever possible.

Flags were used formerly to stop trains at "flag" stations for passengers, and at telegraph stations for orders. In England it is common to "raise" a ball or to "drop" a signal-board into the "stop" position.

Flags for Signals. Flags and set lights on trains are used to inform train men of the character and make-up of the train and to notify station, train and track men of a following section or train. When a second section follows closely upon the first, the first section bears two green flags to caution switchmen and others of the immediate approach of another train.

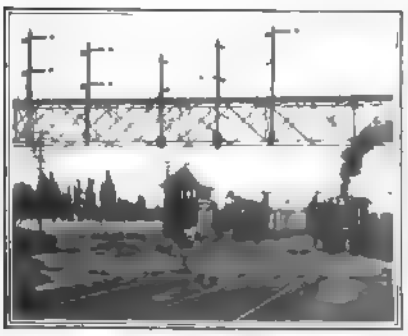
Torpedoes and colored fire or torches are used frequently, especially as "stop" signals when a train is compelled to hold the track.

Alarm Signals. Red fires, past which no train is allowed to run, are timed to burn a certain number of minutes, so that the train which left the fire may get a good and safe start.

The bell-cord running through the train was used formerly by trainmen in signaling the engineer, but now such signals are given by means of compressed air, operated by a cord, each car having individual equipment, and all being connected with the engine.

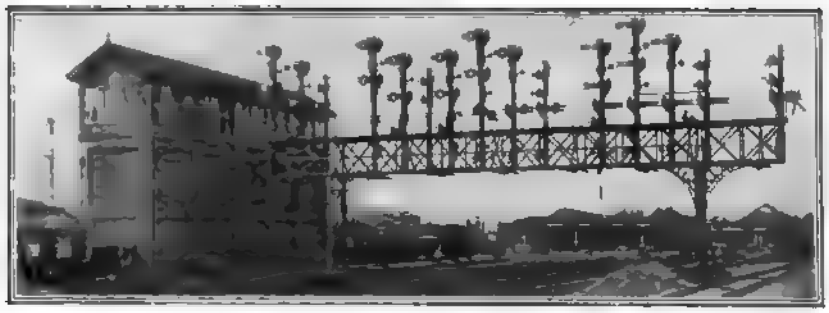
To the General Public. All the signals enumerated help to safeguard property and limb and life. The simplest, other than these, is the plain warning, everywhere posted, to keep off the track unless having business with the road. Persistent disregard of this caution by the public is responsible for no small number of accidents.

The next simplest signal is the "Rail Road Crossing—Look Out for the Cars" sign placed at grade crossings, frequently supplemented by an automatic "rattle-gong," that keeps up a constant ringing when a train approaches the crossing.



OVERHEAD BLOCK SIGNALS

INTERLOCKING SWITCH AND TRACK INDICATOR



SIGNAL STATION AT CREWE, ENGLAND

Automatic Block Signals.

The functions of a signal system are twofold—to protect traffic and to facilitate operation.

Function of Block Signal. The automatic block signal, the direct purpose of which is to prevent collisions, is merely the latest manifestation of the determination of the Steam Roads to safeguard life and property in every way.

The first steps in this direction were exceedingly crude and imperfect. A post was placed midway between sidings. If, upon the arrival of a train at the siding where it was scheduled to meet another, the latter had not reached that point, the first train moved forward slowly toward this post.

How the Old Plan Worked. If it met the other train before reaching the post, it backed to the siding it had just left. If it reached the post first, the other train backed until it reached the last siding which it had left. Under that system there necessarily was great loss of time and always danger of collision.

Unsurpassed Order. Nowadays, after trains receive starting orders upon any dispatching division, they can run safely through without another order, provided the automatic signals are heeded implicitly. In fact, the engineer can read danger or safety from these signals, but in some cases, if he neglects or overlooks, he is called back by the automatic blowing of a shrill air whistle.

The importance of the dispatcher on lines that are automatically blocked is in giving trains their starting orders, in providing for the safe passing of slow trains by fast trains, and in keeping the main track clear for regular traffic.

As the Waves of the Sea. The number of automatic signals in service on different Rail Roads is already 30,000. Most of the busier Rail Roads are equipped with automatic signals, at least on a portion of their lines. While the system is not perfect, yet there is only one failure to 22,000 signal operations. Further, if the connection with a signal be

broken, the signal is so weighted that it immediately goes to danger, and the worst that can happen in such a case is delay of traffic.

A road so equipped is divided into sections, or blocks of, say, two miles each. The instant a train enters a block, the fact is automatically announced on the signal which protects that block and which only returns to safety when the train leaves the block. It is not generally known that telegraph operators are stationed day and night in the block-signal towers.

The engineer of the following train is, therefore, in a position to tell whether he may proceed at full speed, or must use caution. Some Rail Roads are provided with signals which show the condition ahead for two blocks of track.

The Man Behind.

Whichever way we turn, we find signals safeguarding the Rail Road. It is, however, impossible to get away from the "personal equation," for in every case—flag or lantern, whistle, bell, or block—the signal must be kept in working order and set or watched by hand and eye.

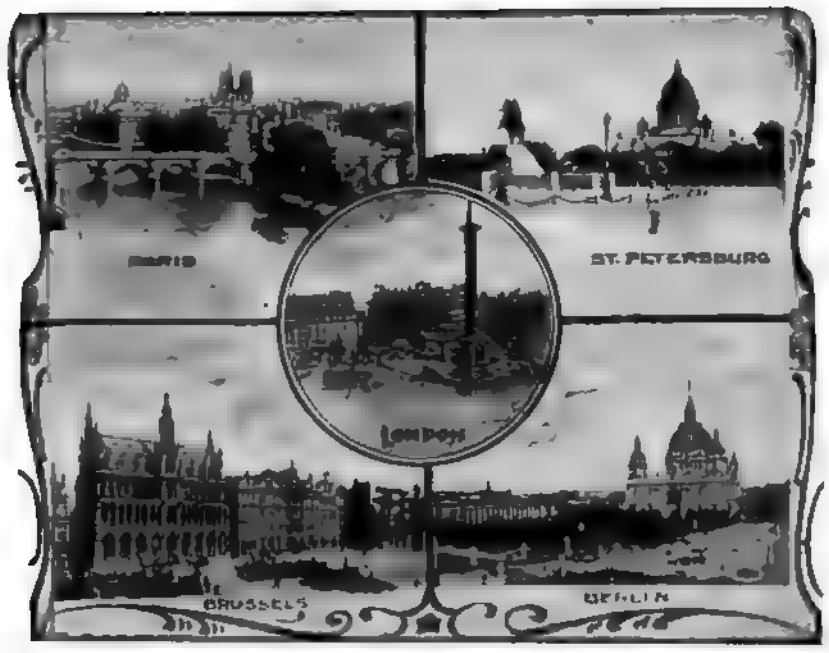
If defects never were so latent that they escaped all attention; if there were never any sudden or violent breakages from causes not under human control; if rails never snapped from extreme cold; if snow and ice, rain or wind never interfered with perfect signal and other operation; if culvert timbers never caught fire and burned away after the track-walker passed; if nothing ever happened except by man's fault, still would there be accident and disaster.

Human Failings.

An eye would fail to catch correctly the position of the semaphore as the train flew by; an ear would fail to hear the exploding torpedo; a hand would fail to write a word in a telegraphic order; a mind would woolgather for a moment.

The Rail Roads may safeguard as they will; they cannot make safety absolute. But may they not be given due credit for their efforts and improvements?

PRIMITIVE CARRIAGE IN EUROPE



PARIS, ST PETERSBURG, LONDON, BRUSSELS, BERLIN
SCENES IN CAPITALS OF THE WORLD.

SECTION XXX.

THE TRAFFIC MOVEMENT AND RAIL ROADS OF THE WORLD.

THEIR EFFECT ON PROGRESS AND PROSPERITY.

A Comparison.

Looking Abroad.

Inasmuch as we have found that progress and prosperity have been dependent upon, or a consequence of communication and intercommunication by means of transportation, it will be well to look into the progress and prosperity of other lands than ours, and compare the periods and the character of the growth of other nations with the development and extension of their land transportation and the character of the service rendered—and the cost.

By comparison only can be determined whether things are small or great, cheap or dear, good or bad, reasonable or unreasonable,

and whether we in the United States are faring well or badly. If a man has a thousand dollars and succeeds in adding one dollar to it, the fact is of little importance. But if he has but one dollar and adds another, then it is noteworthy; by comparison the second dollar has become important.

If a man can buy in one place for $9.99 that which costs $10 in another, the advantage is not marked, but if we can buy at one place for 50 cents what costs us $1 or even $2 in another, a most decided advantage is ours.

The Determination of Value.

If we find calico selling in one store at four and a half cents a yard, at five in another, and five and a half in a third, we say the market or average price of calico is five cents in that town. When we find that potatoes sell at 45 cents here, at 50 cents there, and at 55 cents somewhere else in the same town, we place the market value at the average of 50 cents; or with flour at $4.75, $5.00 and $5.25, we will give the market value as $5.00.

The World Is One.

The world to-day is substantially one vast unit, owing to the cable, the telegraph, the postal service, the land and the ocean Rail Roads, and other means of quick communication and transportation.

As a result, the business customs and systems of the civilized world run more or less in the same channels. Many commodities sell at substantially the same prices, even in places thousands of miles apart. Each country is simply one of a great number of traders and business competitors of varying importance.

Freight and Value.

Substantially the only difference between the wholesale price of a barrel of flour in Minneapolis and in New York is the freight charge. If retailers in one town sell at a much higher price than those in another, they are exacting an additional profit from the consumer for themselves.

In Liverpool, England, cotton is substantially the same price as in Galveston, Texas, the greatest port of supply, plus the cost of transportation.

OPENING OF THE STOCKTON & DARLINGTON RAILWAY, 1825. HORSEMAN AHEAD TO WARN PEOPLE FROM THE TRACKS.

ENGLISH LIVESTOCK TRAIN, 1832

If the trader in a foreign nation that produces or distributes an important article of commerce in competition with us, is able to ship his raw or finished products at a rate lower than the American shipper can transport his wares for the same distance, there naturally results an extension of the market area of the foreign nation and the shrinkage of the trade of the American shipper.

Finding the Market Price.

Let us see if such is the case, or how the matter stands, and inform ourselves about the average charge, or market price, for land transportation throughout the world; let us see how the land transportation and facilities, charges, etc., of the United States compare with those elsewhere. In effect, let us see who's who in the commercial and transportation affairs of the world, and if possible, why.

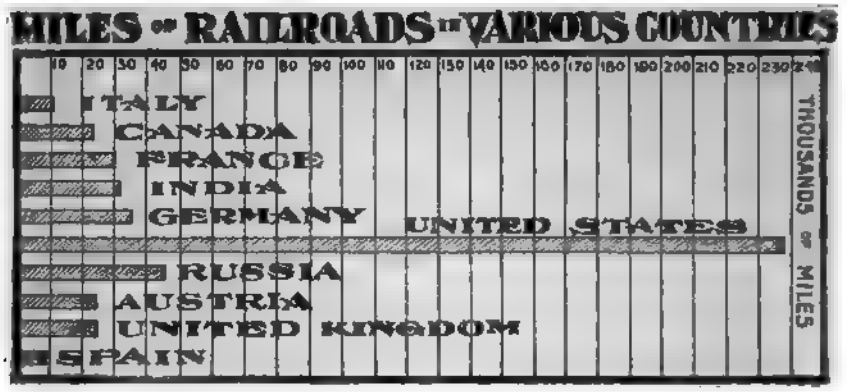
A Broad Comparison.

We will endeavor to give the facts of the land transportation systems of the different nations of the world briefly but comprehensively, and as far as practicable compare their business policies, financial methods, capitalization, rates or charges for service, operation and wages paid to operatives, with those of the United States. We may also gather what influence better means of transportation has had upon the style of living, on wages, and progress and prosperity.

On Questions of Policy.

Inferentially one may form his own opinion as to whether government ownership, state control, or private enterprise and competition have produced and are producing the cheapest, best and most satisfactory service.

GEO. STEPHENSON.



MILES OF RAILROAD IN VARIOUS COUNTRIES.

The Total Rail Way Mileage of the World.

Let us look at the steam highways of the world, its best trade routes. In all the countries of the world, there is a total length of about 600,000 miles, according to the 1909 compilation of direct lines of Rail Roads. Only about 180,000 miles, or 30 per cent, are government owned and operated, and substantially 420,000 miles are privately owned and directed.

How Divided. The total length of Rail Roads in Europe is 197,381 line miles, as compared with 236,541 in the United States, 74,584 in Canada, Mexico, Central and South America and the West Indies, 55,367 in Asia, 18,321 in Australia, and 20,091 in Africa

Official estimates place the capital invested in the Rail Ways of the world in excess of $50,000,000,000.

Foreign Rail Roads. The Rail Roads of the United States stand out prominently when proportionate mileage and capitalization are considered, for with 236,000 miles of line, we have but $13,000,000,000 net capitalization, while European Rail Roads, about two hundred thousand miles in length, have a capitalization of $25,650,000,000.

Mile for mile, the world's average capitalization is 53½ per cent above that of the United States; the per mile average for the world, excluding our own mileage, is almost double, or 90 per cent above our capitalization, while that of Europe is double ours and 33 per cent more.

Government Ownership. Of the European Rail Ways, an aggregate of 90,000 line miles, 45 per cent, is owned and operated by various governments. Private companies operate an aggregate of 110,000 miles.

These figures run contrary to the belief widely held in this country, that foreign Rail Roads, and especially those of Europe, are mainly government owned and operated.

Public Regulation.

In respect to the control which European governments exercise over the Rail Roads, the roads may be divided into three classes.

The British Rail Roads, although under the supervision of the Board of Trade, which has the right to name maximum rates, are asserted to be freest from government interference in Europe. They constitute a class by themselves.

Classification.

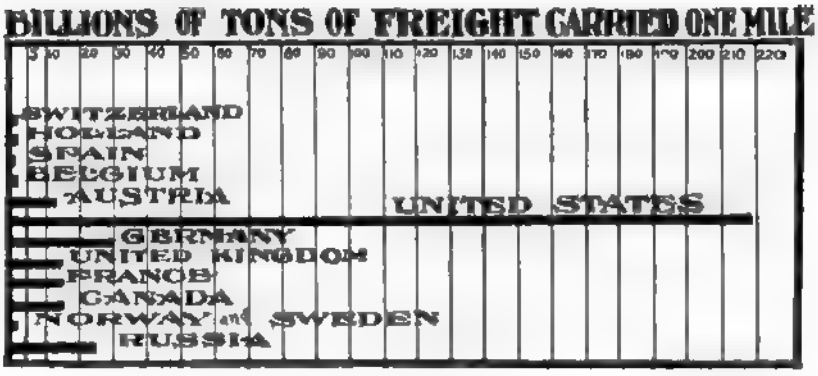
In another class are the French roads, some of which the government operates. The private companies are under strict governmental regulation.

The German, the Italian, the Belgian, and a number of other continental systems, constituting the third class, are purely government properties, owned and operated by the state.

Politics and War.

Under this head may be included those in many important countries where the policy of government ownership had as its key-note or dominant motive, military necessity and strategy, to make easier and speedier the unleashing of the dogs of war.

In other cases, the taking of the Rail Roads was largely a political move or a concession to please the socialistic element.



A BIG PART OF THE WORLD'S WORK.
THE BILLIONS OF TONS OF FREIGHT CARRIED ONE MILE IN VARIOUS COUNTRIES.

GREAT BRITAIN.

Inconveniences of Travel.

When traveling by rail in Great Britain in cold weather, one is cautioned to and must use a "rug" or a lap robe, just as one does in driving in an open vehicle in the United States; the traveler may hire a foot warmer, a rug or a pillow, for a shilling each.

While the steam Rail Way originated in England, equipment there lacks many improvements and comforts we consider essential in the United States. Many of their cars are unheated.

LONDON RAILWAY STATION, 1833. NOTE THE UNIFORM OF THE FLAGMAN.

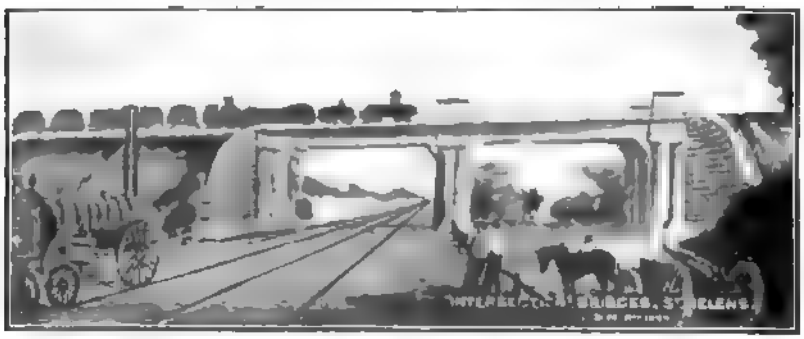
Hundreds of Companies.

It was in the first quarter of the nineteenth century that England accepted the steam Rail Road. It developed rapidly, and by the end of 1843, seventy-one independent lines, averaging thirty miles each in length, had been constructed; in the next four years 637 companies were chartered to build about 9,500 miles of line, an average of less than fifteen miles each.

Chartered, Not Built.

But of those which lived beyond the paper stage all were not constructed immediately, for in 1847 only about 5,000 miles of line and in 1872 only 13,000 miles were in operation. To-day the English lines comprise about 15,000 miles of the total of 24,963 miles of Rail Road of the United Kingdom, including Ireland, Scotland and Wales. There are but six companies operating this mileage and they are largely non-competitive. There have been many consolidations.

In the United Kingdom the capital cost of the Rail Roads was $272,523 a line mile on July 1, 1909, a total of $6,803,000,000, and the capital charge or return to the security holders alone was practically within a thousand dollars of our total gross receipts per mile: that is, the interest charge was about $10,000 a mile.



AN ENGLISH RAILWAY TRAIN IN ...

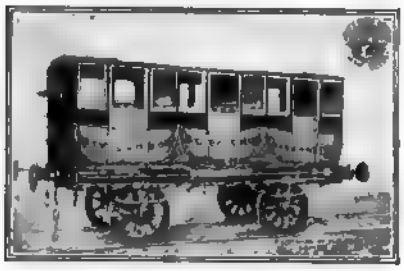
Double Track. In fairness, one must, however, consider that in Great Britain the mileage of second, third and fourth tracks equals a much greater percentage of main line than here, for the greater part of American roads is single tracked. There were in 1909, 12,926 miles of double track in the United Kingdom, about 50 per cent of the total mileage being two-tracked.

The early English Rail Road seems to have exactly conformed to the definition that it is a "road with rails." That this conception was the current one is indicated by the adoption of the turnpike principle of rates, where the shipper furnished his own wagons and paid road toll, the calculations and schedule of charges for which were listed on pages and pages of rate books.

LOCOMOTIVE ENGINE, "NORTHUMBRIAN," BUILT 1830 NOTE RELATIVE SIZE OF MEN AND ENGINE.

Rail Road Tolls. The maximum rate of toll was specified in the charter, and this custom was retained longer than elsewhere. English freight cars are still called "waggons," and in size are little more, from our standpoint, the average capacity being ten tons. There are few enclosed freight, or what we call box cars.

From the American point of view, English rate making under a Board of Trade shows many peculiarities. The Board recognizes the necessity of low tariffs for competing points and towns with water facilities, even though places on the same line and nearer to the same market pay 50 per cent higher rates. The main intention is to name a rate that will enable business to be maintained and developed



LIVERPOOL AND MANCHESTER RAILWAY CARRIAGE, 1838.

AN EARLY ENGLISH RAILWAY CROSSING.

Discrimination Customary. The necessity of other special rates is also recognized, for about 75 per cent of the merchandise and mineral traffic is carried at less than schedule rates, and more than half the foreign business is done in owners' cars.

The Liskeard & Caridon, a short Rail Road, has a maximum on confectionery of five and one-third cents. While this is a low rate for such light freight there is a rate of six cents on metal—iron, therefore, paying a higher rate than candy. The latter charge is probably twelve times the average rate on iron in the United States.

Do What We Condemn. Were we to follow the English lead, we should have apparently to repeal many laws, among them the Interstate Commerce Act, and would have to cease condemning rebates and discrimination.

The decrease of net earnings of English roads, which from 3.67 per cent on the capital in 1899 had dropped to 3.32 per cent, led in 1908 to working arrangements designed to lower expenses by cutting out trains and dividing traffic. All traffic from English to Irish points was made non-competitive. It was said in 1909 that rates would be raised.

A Preventive to Reductions. The roads are careful to make no lower freight rate than the maximum named by the Board of Trade, lest a still lower scale be ordered all around.

Legislation Hampers British Industry.

British Rail Road legislation has resulted in inelastic relations between the roads and the shippers, as the former are no longer free to act on purely commercial considerations.

Reductions Not Cardinal Idea. President Hadley of Yale said that "the English Board of Trade is more occupied with the question of how to keep the right proportion between the existing rates than how to lower them."

While American Rail Road rates have decreased 18 per cent since 1892, British rates have remained stationary.

Impractical Revision. Several years were taken by the Board of Trade, in revising rates, yet it took several years longer for business interests of the companies to reach a point where these slight changes could be accepted. To-day, able British economists assert that "even this careful and slow revision was a mistake."

At the same rate of progress, on a mileage basis, it would require ten years to revise American rates, but in the meantime economic conditions would have so changed that the revised schedule would be valueless by the time it was completed.

Business vs. Politics. That competition results in rates more beneficial to the shipper than does Government control, seems to be indicated by the fact that the average rate per ton per mile on British roads was 2.53 cents in 1908, more than three times the average in the United States. The collection and delivery of goods or cartage is, however, in some cases, included in the British freight charge.

It has been pointed out that about four billion dollars, or two and a half dollars to each one now paid, would be added to the American freight bill if the people of the United States had to pay the same rates as the English shipper. It is interesting to note, also, that 78 per cent of English freight traffic comes under the head of minerals, but contributes only 46 per cent of the freight revenues.

Passenger Traffic. The average passenger haul is 7.8 miles, scarcely an interurban, or a commuter's journey in America. The average rate per passenger per mile was 2.07 cents in 1908. This average rate, however, is not comparable with that of the United States, as we have no third and fourth classes. The prevailing rates are four, two and a half and one and a half cents per mile, for first, second and third class travel, respectively.

The third class rate is interesting, for the reason that it is half a cent below the "Parliamentary" rate with which we deal a little farther on. It would seem that competition has resulted in lower rates than regulation.

ENGLISH GOODS TRAINS, 1882 1910

The equipment is very often in poor shape on the less important lines, while for the two cents for first class or day coach travel in the United States, carriages are offered that are almost always in good order. In Scotland and on many trains in England second class carriages have been abolished.

Express Trains Extra.

Each road is compelled to run one "Parliamentary" train daily, with third class fare at two cents a mile. On express trains third class fare is greatly in excess of this, and runs as high as three cents a mile, with second and first class fares at 4 cents and 6.2 cents, respectively.

ENGLISH PASSENGER TRAINS, 1830, 1835, 1910.

The short distances and the few passenger trains operated at night enable light or package freight to be carried at greater speed, and, therefore, delivered more promptly than in the United States.

Baggage Not Encouraged.

The excess baggage rate is extremely high. On the London and Northwestern, which is the largest system and carries a tenth of the passengers and freight, the charge per 100 pounds for less than 50 miles is 50 cents; between 50 and 150 miles, one dollar; between 150 to 300 miles, $1.50, and above 300 miles, $2.00 per 100 pounds. Besides, the traveler must see to it that the luggage is put into the right van.

Notwithstanding the much higher rates on British Rail Roads dividends are not very high. The average rate in 1908-09 on ordinary capital was 2.99 per cent, and on preferred 3.42 per cent.

Prosperity on Small Scale.

Rail Road receiverships are fewer than in the United States, due probably to the fact that between important points there is less competition. Further, the roads, as a rule, have been steady, although not large dividend payers.

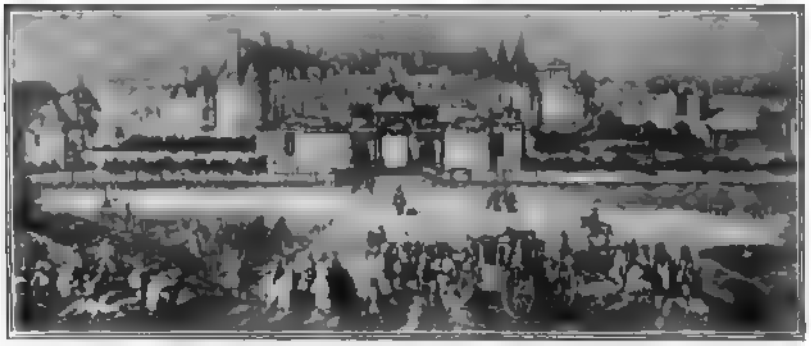
The country is compact, population dense and crops not so subject to wide fluctuations in quantity as with us. The Board of Trade, recognizing a duty to the public and the investor alike, makes no rates that would be unprofitable or that would deprive the investor of a fair return.

A considerable reduction of Rail Road dividends would be considered a public calamity, and when they fall below normal it is regarded as a national misfortune.

The Kernel.

To epitomize: British Rail Roads are capitalized for about four times as much per mile as American lines; passenger rates on first and second class traffic average nearly double ours, and the average freight rate is about three and a half times as great.

Yet they have but one mile of Rail Road to ten in the United States. The total capitalization, however, is one-half of ours. Yet on this mileage the British Rail Roads hauled 90 per cent more passengers than were hauled on the almost quarter-million mile system of the United States, the number of passengers being 1,725,000,000. Their total receipts are a fourth of ours, and their income per mile over $25,000 per year, or $68.93 per day, nearly two and a half times ours. For this sum, 1,590 passengers and 1,451 tons of freight are hauled over each mile daily, against 345 passengers and 2,596 tons per mile in the United States daily.

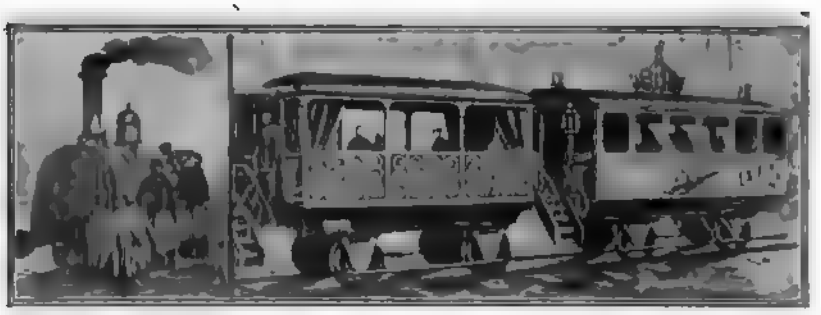


TRAVEL IN FRANCE BEFORE THE REVOLUTION.

THE FRENCH RAIL ROADS.

France vs Three States.

France has a population almost one half that of the United States, but its 30,000 miles of Rail Way only equal those of the states of Indiana, Ohio and Illinois.



PRIESTS BLESSING AN ENGINE, 1847. ROYAL TRAIN OF NAPOLEON III.

Although French Rail Road history began when in 1830 a line was built from Paris to St. Germaine, coincident with the Baltimore and Ohio, it was after 1846 that extensive construction was entered upon.

Rail Roads as a Luxury. With the best and most perfect canal and highway system in the world, sufficing for the transportation requirements of the time, it is not strange that economy ruled or that many then considered Rail Roads an unwarranted luxury.

As a result, France alone possesses a carefully conceived, cautiously built and scientifically planned system, which avoided duplication and waste of capital. But this very thing has meant lack of competition.

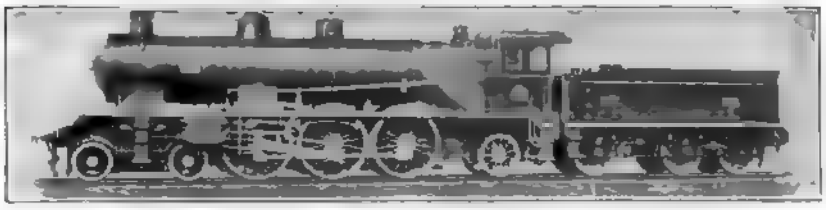
France To-day. The principal companies are the Chemin de Fer du Nord (the Rail Road of the North), de l'Est (of the East), de l'Ouest (of the West), d'Orleans (of Orleans), le Midi (the Central), and de Paris, Lyon, et la Mediterranee (of Paris, Lyons and the Mediterranean)

When these Rail Roads were laid out, the French capital was held conspicuously in mind as the "hub," and its Rail Roads radiate like the spokes of a wheel, so that in modern Gaul practically all roads lead to Paris. This idea of Paris as the hub was but in line with the canal and highways systems planned and commenced under Louis XIV. In the south and southwest many companies operate short lines, which seem to exist merely as feeders to the larger systems.

Subsidies. From the outset the government granted construction subsidies to private companies. In 1859, this plan was superseded by a general guarantee of bond interest, which, in 1883, was extended to dividends.

The government pays yearly about 100,000,000 francs in guaranteed interest. The government has not absolute power to regulate rates, but no tariff can be put in force until approved by the Minister of Public Works.

The minister may reject the tariff but he cannot approve part and reject part.



MODERN FRENCH 4-CYLINDER BALANCED COMPOUND, BUILT IN AMERICA

Right of Initiative.

The right of initiative in the matter of rates belongs always to the companies. The minister's former right to name or abolish a tariff has been taken away, and French rates have been averaging about the same year after year.

The government, however, is bound to the Rail Roads even more intimately, for it owns the right of way, the companies owning only the superstructures, equipment, etc.

Unusual Economics.

French Rail Road finance shows interesting, though to us remarkable, conditions. The Western Rail Road, for such trifles as guaranteed interest and loans in times when the income did not meet running costs, etc., owed the government in 1909, at which time it was purchased by the government, $67,000,000, on a property the total value of which was less than $68,000,000. The stock and bonds owned by the public probably represented as much again.

The Southern Rail Road, the P., L. & M., owes the government substantially $49,000,000 on property said to be valued at $45,800,000.

A Debt Worth Consideration.

The combined debt of all the Rail Roads to the government is now about $240,000,000, of which $170,000,000 is for advances made, and $70,000,000 for unpaid interest on advances. On the construction and purchase of Rail Way lines the government has spent an additional $960,000,000.

TYPES OF FRENCH LOCOMOTIVES

THE SEINE AND PONT DES INVALIDES, PARIS

The French View of Regulation.

The government takes the ground that with entire control in behalf of the people and for the people, the people should stand the losses if any are incurred.

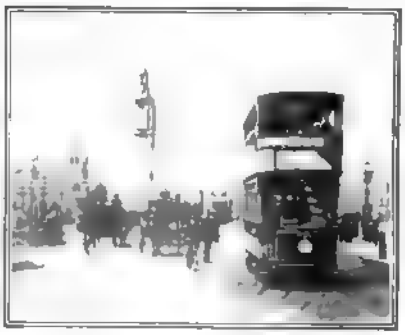
High Capitalization. With cheap labor and with no expensive trio of parallel mountain ranges such as the Alleghenies, the Sierras and the Rockies to cross, these lines, nevertheless, are capitalized at $137,276 a mile. Under the French method of government control, it costs $1.44 to haul a ton of freight 100 miles, 88 per cent more than with us; it should be considered, however, that the canals carry much of the low-class traffic.

Only mail trains carry first-class passengers, who pay three and three-fifths cents a mile; second-class travel costs two and two-fifths cents a mile, and third-class passage one and three-fifths cents.

A Tax on Tickets. On tickets costing more than $2 there is a 10 per cent tax, and in many cases there is a supplementary charge for extra-fast trains—that is, for the all-Pullman trains or "limited," as we would say; or, as they call them, "trains de luxe."

The service rendered by each mile of French Rail Roads costs the public $35.70 per day, for which 1,042 passengers and 1,360 tons of freight are carried.

QUAY AT MARSEILLES



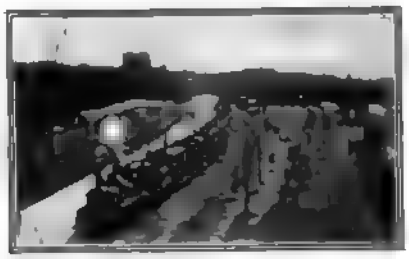
DOUBLE DECK TRAM CAR, PARIS

TYPES OF RAILWAY STATIONS, PARIS.

Passengers must book their own baggage and procure tickets for it. Sleeping and dining cars are found only on the chief trains. Sleeping or parlor-car space, if engaged in advance, must be paid for, as a rule, whether used or not. On other trains pillows and coverlets may be hired for a franc, or 20 cents, each; refreshments are obtainable at the large stations. There are many "extras," the most important being the tip or "pourboire," which, while theoretically a gratuity, is in reality an exaction.

Thorough and Efficient.

As a whole, the system, with its complete subserviency to real Rail Road engineers and purely business directors, is probably the best example of government ownership or control in the world. Yet it is found that the capitalization and rates are from a half as much again to twice as much as our own



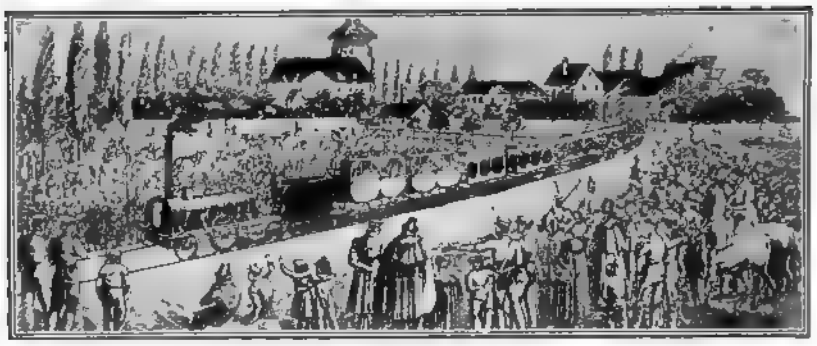
VIEW OF A FRENCH RAILWAY

GERMAN RAIL ROADS.

In the Light of Contrast.

Germany, an imperial federation of 26 kingdoms, duchies and principalities, has 36,686 miles of Rail Roads, only slightly above the combined mileage of Pennsylvania, Illinois and Iowa, which have an area three-fourths that of Germany's 208,830 square miles.

Notwithstanding the comparatively small area and Rail Road mileage, the empire's population in 1908 was 62,557,000, four times the enumeration of the three American states mentioned, which,



OPENING FIRST GERMAN RAILWAY. NUERNBERG TO FUERTH, DEC., 1835.

it may be estimated, therefore, have only one-fifth as many persons to the mile of Rail Road as Germany.

Government and Private.

Ninety-two and a half per cent of the mileage is owned by state or principalities, only about 2,750 miles being privately owned.

The roads operate 2,500 locomotives, which is 69 per 1,000 miles of line, contrasting poorly with 246 per 1,000 miles of line in the United States. Despite our broad expanse and sparse population, we have three times as many locomotives per mile of line. There are also 50,000 passenger and 511,150 baggage and freight cars in Germany.

One thousand four hundred and seventy-nine passengers and 2,266 tons of freight are daily carried over each mile of German Rail Road for $49.88. While these roads haul 1,134 passengers more than ours, the American lines carry a freight load 330 tons heavier. Yet the German Rail Ways' charges are $21.51 heavier than ours per day.

Large Profits, but——

The net revenue of the government was $248,858,000, almost as great a sum being taken therefore by the government in the form of profit from the people for the operation of 34,000 miles as is paid in the shape of dividends to the holders of the stock on our 236,000 line miles, six and a half times as much as in Germany.

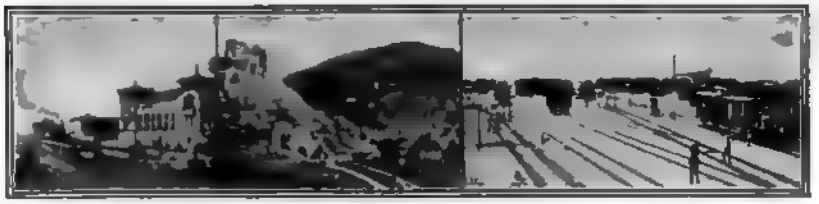
The government Rail Roads charge such high rates that their net earnings average over 7 per cent, the figure for 1908 being

EARLY GERMAN LOCOMOTIVES USED IN [illegible]

7.17 per cent, the German shipper thus paying dividends approximately 100 per cent above the average paid by the shippers of the United States to private corporations in the way of profit for having his transportation work performed. On this basis our earnings on stock would be almost half a billion dollars.

First German Roads. Rail Roads were introduced about 1825, and the first steam line was opened in 1835. In 1838 Rail Roads began to assume importance.

Originally all the roads were private enterprises, but the states reserved the right to acquire them after a term of years.



EARLY GERMAN RAILWAY SCENES. MODERN GERMAN SWITCHING YARD.

To Save Waste. Lack of sufficient private capital and operation unsatisfactory to the government speedily led to this option being exercised in every state outside of Prussia. Brunswick led the way in 1838.

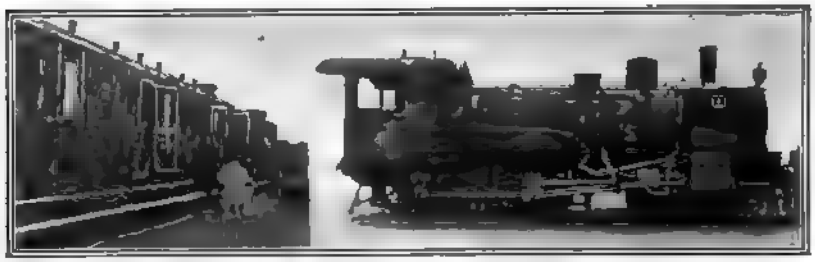
Prussia began to take over the lines in 1849, but only about one-third of the mileage was acquired when the war with France closed in 1871. In the next few years, however, under the policy and leadership of the Iron Chancellor Bismarck, practically all the remaining lines were acquired. Bismarck's pet scheme, however, the fusion of all the lines into a single imperial system, failed.

Method of Purchase. The Rail Roads were capitalized for purchase at about 25 times the average earnings for five years, which were 3½ to 4 per cent; future earning capacity and construction cost also were estimated and considered. Most of the stockholders accepted government securities for their holdings.

In 1909 the capital cost reached an average of $108,872 per mile of line. Yet labor is cheap and construction presents few physical difficulties. In all of North Germany there is not a single Rail Way tunnel, and between Berlin and the "Hook of Holland" there is not a deep cutting nor high embankment. Bridges and viaducts are the only important engineering works.

Cheapness, not Perfection. It is said the equipment of the German roads has deteriorated until it is less efficient than that on American Rail Roads 15 years ago. It is said that "three-quarters of the German freight equipment would be thrown into the scrap heap" in America on account of the extravagant operation costs entailed.

For several years German engineers have been actively preparing for an ultimate change to electric motive power, which, it has been determined, would effect a net saving of $11,750,000 a year, assuring five per cent interest on the $220,000,000 capital required for the alteration.



GERMAN PASSENGER TRAIN PRUSSIAN LOCOMOTIVE, STATE RAILWAYS.

High Rates.

Trifling Saving.

The decrease granted in 10 years on freight rates was only from $1.32 to $1.25 a ton per 100 miles. In the United States, in the same period, the rates decreased from 90 to 76 cents, or 233 per cent more in proportion.

Notwithstanding far cheaper labor, and the advantage of a density of population equivalent to a town of 1,700 persons for each mile of road, German freight rates, including terminal and other charges, are about $1.44 for 100 miles, or within 10 per cent of twice those of the United States

Places for "Friends."

Operating expenses are very high, running from 65 to 70 per cent, despite much lower wages. This is inevitable under the political administration of the Rail Roads, because, as it is said in Germany, every politician has one or more "friends" who must "be taken care of."

As a consequence, many persons are crowded on the pay rolls of the Rail Roads, the list of employes being further swelled by the fact that certain non-commissioned army officers are entitled to employment on the Rail Roads on the expiration of their terms of service, and places must be found for them.

Passenger Fares.

While the average passenger rate is 96-100 of one cent per mile, due to a large percentage of third and fourth-class travel, which cannot be compared with any of our service, the first-class passenger rate is three and one-tenth cents. On some trains, fourth-class cars, unprovided with seats, are run, the fare averaging three-fourths of a cent per mile

Round trip tickets at less than two full fares have been abolished, and no baggage is carried free.

Tax on Tickets Fails. A graduated tax was placed on first, second and third-class tickets in 1906. Instead of producing 37,000,000 marks additional annual revenue, however, it has brought in less than 20,000,000 annually, and has greatly reduced passenger traffic revenues, for many who formerly traveled first-class now go second-class, the tax on second-class tickets being but half the tax on first-class. In the United States we would hardly countenance such a plan.

A car service association was recently organized in Germany. Practically the same rules that covered the exchange of cars between Germany and foreign countries had existed previously between the different German states.

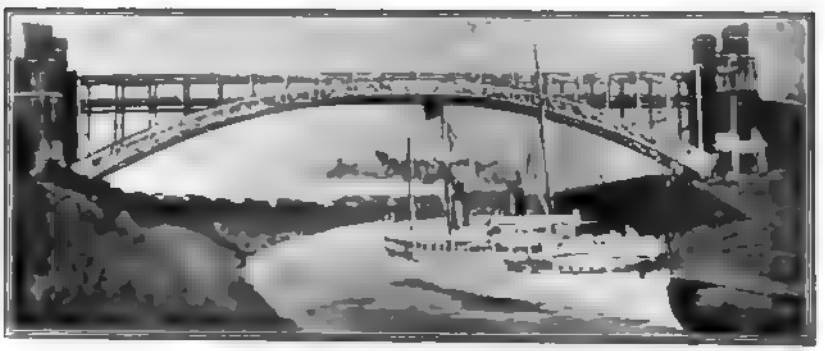
Local Jealousies. Local jealousies are keen. Engines of one state must not cross the border of another. At Leipsic, for instance, Saxon trainsmen push cars over the Prussian border, where Prussian pushers take charge.

The empire is peculiarly favored with large rivers, on some of which boats of 2,000 tons ply far into the interior. Navigation on the Rhine extends almost to the southern border.

Canal Competition. It is said that new industries are forced to locate upon water ways, and even then they cannot expect as low freight rates as are common with us, for water rates are not allowed to be so low as to destroy Rail Road profits.

In the United States, where water ways exist only occasionally that compare with those of Germany, competition is keen; the Rail Roads appear to have the best of the contest and seem to have largely put the steamers out of business.

Cheap and Quick. An example of the American situation is the Erie Canal, which each year has been doing less business, although the wheat rate, for example, is frequently as low as five and one-fifth cents a bushel, less than one-tenth of one cent per pound, for the 525 miles from the lakes to the seaboard.



HIGH BRIDGE OVER KAISER WILHELM CANAL.

The Ideas of Yesterday.

Legislation was enacted in New York state, in the early days of Rail Roading, to prevent competition between the privately owned Rail Roads and publicly owned water ways, but we soon got over it, finding it false economy to prevent competition.

In Germany similar laws were passed and are still in force. The government refuses to lower rail freight rates, so as to permit localities that are without canal facilities to compete with more favorably located rivals.

German Rail Roads as Political Levers.

In Germany rates ostensibly are levied on a mileage basis, yet over 60 per cent of the traffic moves under special rates. It is asserted openly that the rate-making power is traded to secure or defeat legislation.

The Same World.

The natural query, whether we should be subject to the same influences had we government ownership or control, is answered best by another:

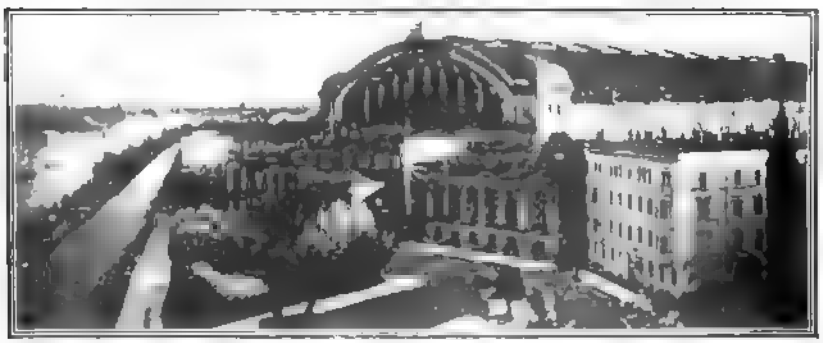
Are our politics superior to those of Germany, or would our politicians be any less likely to use a convenient weapon for furthering their own ends?

Freight rates vary greatly. For instance, the cost of shipping a commodity from Koenigsberg to Hamburg is $1.03 per 220 pounds. The charge for shipping the same quantity from Koenigsberg via Hamburg to Constantinople, in Turkey, is 61 cents, or 42 cents less for the longer distance.

The German state lines openly rebate on large shipments.

A Flareback.

One instance of the policy of preventing one section from interfering with the trade of another concerns the grain growers of Eastern Prussia, who receive a bounty on grain shipped to Scandinavia. Yet Rhenish Prussia, Germany's greatest industrial center, is closed to them because the freight rate to that section is so high as to bar any but local growers from supplying the market



ANHALTER RAILWAY STATION, BERLIN

SUSPENDED RAILWAY, ELBERFELD.

ALEXANDER PLATZ STATION, BERLIN.

The Rhine districts do not produce enough grain to supply local needs. Consequently, while Prussia pays a bounty on exported wheat, the people pay duty on nearly 10 times as much imported wheat.

Trade Restrictions.

No Long Hauls Possible. Long distance hauls are practically impossible, and economists estimate that German Rail Road rates are so high that wheat can be hauled profitably only 125 miles. Under the German system, the great bulk of our grain production would be inaccessible to market.

If German methods of computing rates were in effect here, the price of soft coal would advance $1.25 per ton along the eastern coast, and the Pacific region would be forced to return to the practice, necessary before the transcontinental Rail Roads, of buying coal from Australia.

Some Results. In 1880 a German Government commission reported that the United States could never compete with Germany in iron manufacture, as the ore beds were too far from the coal to be brought together for smelting, except at a prohibitive cost.

But to-day Michigan and Minnesota ores are smelted within 125 miles of New York, from approximately 1,000 to 1,200 miles away, and some of our iron and steel sold to German purchasers.

Strange Changes. If the German principle of handling traffic were recognized in this country, it would destroy such interior cities as Harrisburg, Pa., Springfield, Ill., Indianapolis, Ind., Atlanta, Ga., Birmingham, Ala., Denver, Colo., and Dallas, Texas, and hundreds and hundreds of lesser manufacturing centers depending solely on the Rail Roads for their transportation.

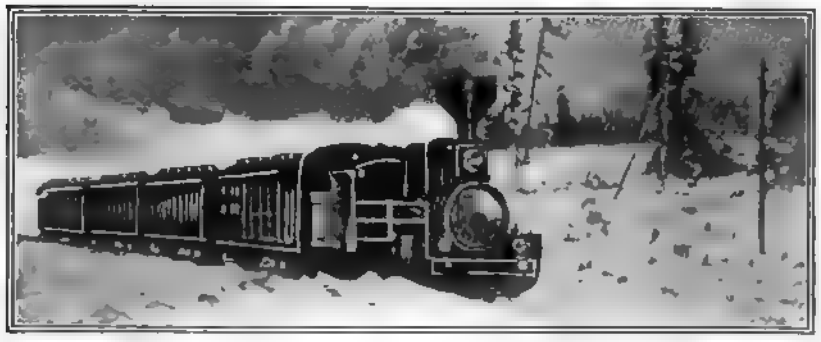
Car shortages are frequent and usually are not so much the result of heavy demand as of failure to anticipate apparent needs.

Criticism Lese Majeste.

But a shipper who expresses discontent with German Rail Road service is informed the Rail Road is doing its best. If he should then condemn the situation in vigorous language, he would be objecting to the methods of his sovereign, and run the risk of prosecution for "Majestätsbeleidigung," or "lèse majesté."

What We Would Get.

On German principles, would not the cost of the necessities of life, and of food supplies particularly, in our eastern cities, be markedly increased and the profits of the farmer and producer be decreased? Thus, would not an overwhelming majority, not only of the nation's workers, but producers, suffer, resulting in injury to the prosperity of industry and the serious checking of the progress of the nation?



A Russian Train.

RUSSIA.

Russian Mileage.

At the beginning of 1908 Russia had 42,953 miles of Rail Road actually in operation, less than one-fifth as much as the United States. There were besides 2,368 miles in Finland. Of the Russian lines, 7,746 miles were in Asia. The government owned about 28,000 miles, and private companies owned the remainder.

An interesting light is thrown on the mileage of Russia when one considers that Russia's mileage is greater than that of any country with the single exception of the United States. Yet Russia has an area two and a half times as great as that of the United States and more than twice that of all Europe.

Russia's Vastness.

Russia includes one-sixth of the earth's land surface. It stretches across the globe for 170 degrees of longitude, almost half around the planet, and for part of the year the rising sun is greeted in Eastern Russia before the sun of the day before has set on the western part of the empire.

The capital or cost of construction averaged in 1904—the latest computation—$94,304 per mile of line, although the entire

MOVING VILLAGE OF NOGAYAN TARTARS, MEDIEVAL TIMES.

amount spent on the Russian Rail Ways to date has been placed at $140,000 per mile. The government itself has disbursed $1,000,000,000 on them in the last 10 years, and the 1910 budget carried $32,400,000 for new mileage and $25,000,000 for improvements. For the six years 1908-1914 the government contemplates expending over $500,000,000.

Double tracking Siberia.

There is now under construction, at a cost of $72,000,000, a partial second track for the 6,677-mile Trans-Siberian Rail Road, the longest in the world. An extension also is to be built, at a cost of $150,000,000. The original cost of the main line was $175,000,000.

In addition, an English company is preparing to build a South Siberian Rail Road at a cost of $30,000,000, on the investment in which the government has been asked to guarantee two per cent profit.

New Russian Lines.

Seven Rail Road projects for European Russia now under consideration by the Council of Ministers at St. Petersburg aggregate 8,225 miles, the estimated cost of construction being $442,800,000.

Russia's first Rail Road was the 16-mile line built in 1842, 12 years after the Baltimore & Ohio was constructed, between St. Petersburg and the present imperial residence of Tsarkoe Selo. The next, opened in 1851, was from St. Petersburg to Moscow, 422 miles.

Location by Ruler.

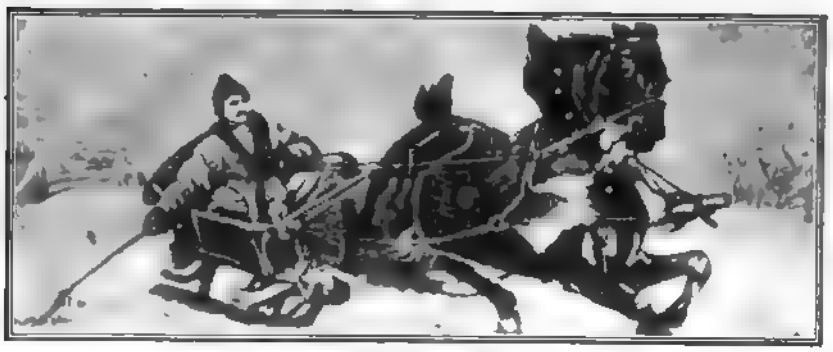
The method followed in locating the latter Rail Road was simple. Emperor Nicholas I is said to have taken a ruler and to have drawn a straight line on the map from Moscow to St. Petersburg, saying, "Build there." Ross Winans, one of America's pioneer locomotive builders, constructed this road, making a large fortune.

Rail Road building was then suspended for a time, but was resumed with redoubled energy after the Crimean war, during which its advantages in such operations were made evident. The Russian Rail Roads constructed since then have been built largely to meet military needs.

The Trans-Siberian. The Trans-Siberian Rail Road, however, connecting the mines and seaports, is of much commercial value and its great ultimate importance is foreshadowed by the great tonnage increase which each year's report shows. In 1902 the tonnage was 1,000,000 tons. By 1907 it reached 2,500,000, and 3,000,000 tons is estimated for 1910.

Even passenger traffic is moved slowly. The run from St. Petersburg to Vladivostock takes 15 or 16 days on the best passenger trains, while the trip from Moscow takes a month, on the ordinary trains.

The Long and Short Haul. Russia has necessarily many long hauls between the interior and its markets. As in the United States, the principle of long through hauls costing less to the mile than short hauls has been recognized by the authorities.

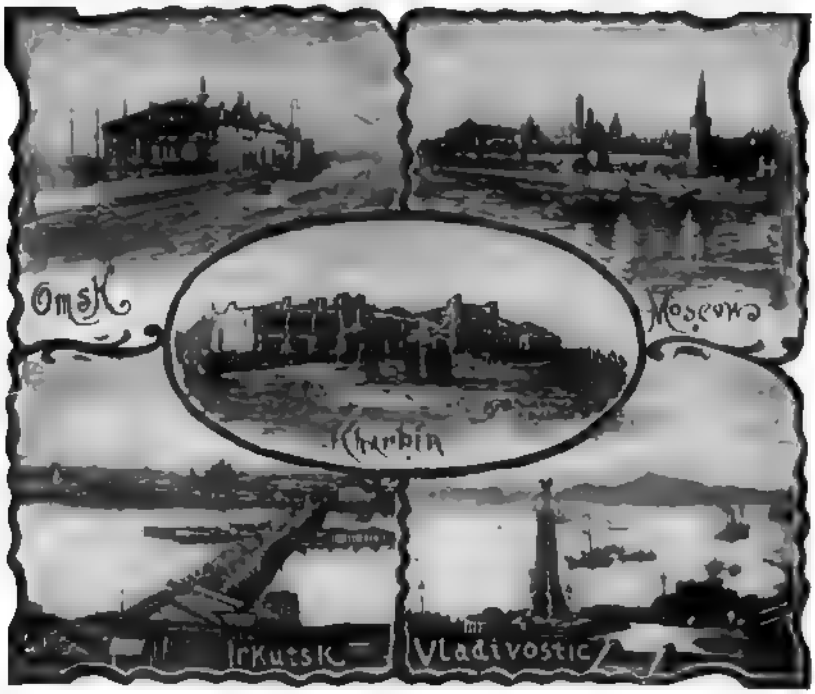


RUSSIAN MESSENGER WITH SINGLE SEAT SLEIGH.

But, as in Germany, attempts to reduce rates in accordance therewith have been vehemently opposed by locality-favored producers.

The Net Result. It is probably due to unbusinesslike policies, as well as water way competition—there are 57,400 miles of rivers, lakes and canals navigable for steamboats and small craft—that Russia's Rail Roads transport only 170,039,234 tons for an average of 152 miles, little more than a ton per inhabitant, while in the United States our Rail Roads handle 16 tons per person for almost the same average distance. The annual total of less than 25,000,000,000 tons transported one mile is a fourth less than that of the Pennsylvania Rail Road.

Russia's Fuel Supply. There are in Russia many important coal mines in the Donetz River region, yet North Russia has been compelled to depend on England for all the coal used in its manufacturing industry, transportation costs rendering it unprofitable for the Russian mines to supply the territory north of Moscow.



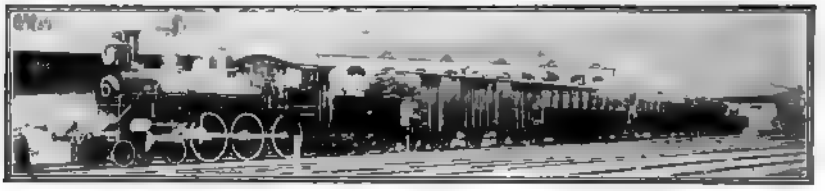
OMSK, MOSCOW, KHARBIN, IRKUTSK, VLADIVOSTIC
CITIES ON THE TRANS-SIBERIAN RAILWAY.

A line authorized in 1908, with a government guarantee, will enable cheaper coal hauling and is regarded as an important step toward the emancipation of Russian manufacturers who now must use English fuel.

America Ahead.

Although the average cost of freightage is 21 per cent greater than in the United States—92 cents per 100 miles per ton—though their present passenger rates for first-class travel average almost three cents a mile; and although the Russian Rail Roads are not required to pay $93,000,000 in taxes as are ours, the Great White Czar loses $30,000,000 to $50,000,000 a year on them. The losses on privately owned roads are in proportion. Since 1900 the combined losses aggregate 914,000,000 rubles ($475,000,000).

In proportion to her losses of $30,000,000 on about 42,000 miles, if her mileage were equal to that of the United States, there would be a loss to Russia of approximately $165,000,000 per annum, a deficit equal to more than a fourth of the total receipts of the United States Government each year. If we add the $93,000,000 taxes now paid by our lines, a total of more than $250,000,000 every twelve months, well on to half the revenue of the United States, would be the cost of Russian government-ownership methods of operation. If we had Russian Rail Road methods, we would pay one-fifth more for freight and about one-half more for first-class passage.



TRAIN DE LUXE, TRANS-SIBERIAN RAILWAY, WHICH RUNS ONCE A WEEK.

The United States vs. Russia.

In that day whose to-morrow saw the successful operation of the Stockton & Darlington, Russia was a world power; for after the burning of Moscow to bring about the destruction of the Little Corporal's army, Europe had held her as a powerful ally against him.

Russia Led U. S. in 1820.

The United States at that time occupied only the position of a nation of frontiersmen. Most of our cities of 1820 would to-day be regarded as mere towns or villages, and much of our vast area was then uncolonized and some scarcely explored.

Comparisons in 1820 between the two nations would not have been to our credit, for the reason that the only thing we could hold up for comparison was land going to waste.

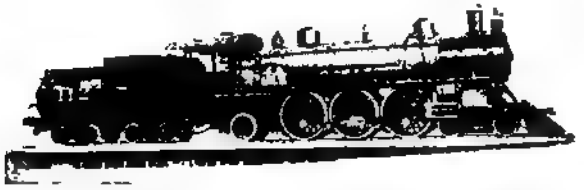
Our Position.

In population, Russia's numberless serfs alone were far more numerous than the inhabitants of the United States, and they represented a monetary value considerably above the then $2,000,000,000 wealth of the United States.

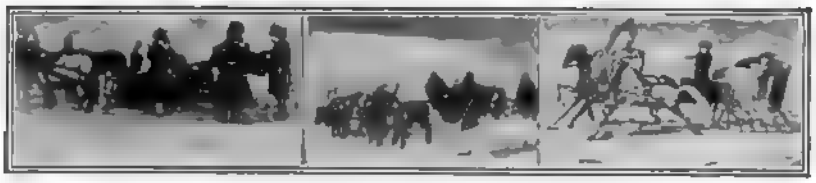
Coming Into Our Own.

The roughly estimated wealth of the United States for 1910 is $130,000,000,000, against the $35,000,000,000 of Russia. The population of our country is nine times as great now as then. Russia's population, meanwhile, has increased from 50,000,000 to 150,000,000, just threefold.

While neither country had Rail Roads then, the present line mileage of the United States, 238,000, is five and one-half times that of Russia, while our 100,000 miles of subsidiary tracks is two and



AN AMERICAN ENGINE.



WINTER TRAVEL IN RUSSIA.

one-half times Russia's line mileage. Though we have made vast territorial additions, the area of the United States is but 41 per cent of Russia's, even to-day.

Rail Roads and Production.

The rank and file of the Russian peasantry are far behind our progressive farmers in wealth, comfort, knowledge and everything that makes for the better and higher life. Their poverty is such that the mass of Russian people are on the verge of what we would consider destitution.

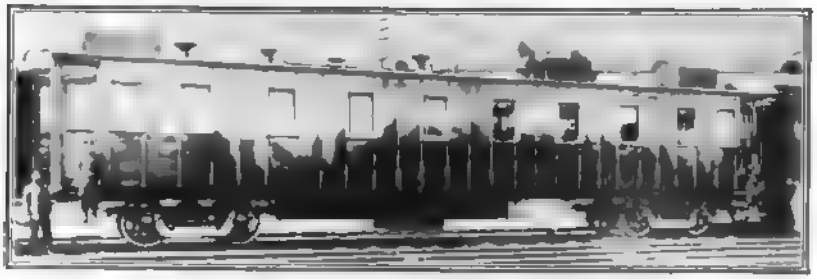
How small the wage or the Russian allowance for living expenses is may be gathered from the pay of farm laborers. In the springtime a male laborer is allowed 34 cents for a day's work, but if food is given him, he receives only 26 cents. A female laborer receives 21 or 15 cents under a like arrangement. It will therefore be seen that the allowance for a day's food for a male laborer is 8 cents, and for a woman, 6 cents.

Living Standards.

A Russian economist, A. Press, calls attention to the fact that "comparatively high-priced food products, like meat, butter, eggs, etc., are used in much smaller quantities by the Russian population than by the American, English, German, French and other civilized nations."

To compensate for the small consumption of these foods, it appears that larger grain consumption should rule in Russia than elsewhere. Nevertheless, Russia uses annually only 660 pounds of grain per capita, against 1,945 pounds, three times as much, in the United States.

The per capita consumption of cotton in the United States in 1904 was 20.4 pounds, in Russia 5.4 pounds; of sugar, in America 78 pounds, in Russia 13.2 pounds; of iron, in the United States 504



BUFFET CAR, TRAIN DE LUXE, TRANS-SIBERIAN RAILWAY.

pounds, in Russia 45 pounds; of coal, in the United States 8,568 pounds, in Russia 3,654 pounds.

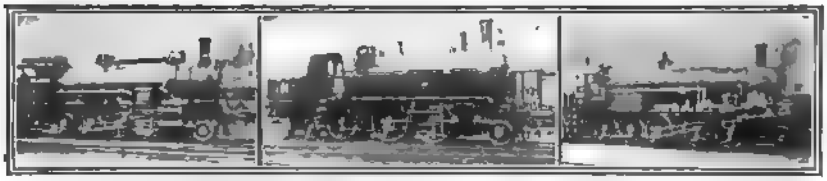
Poverty. The poverty and lack of nourishing food result in much sickness and general impotence. The latter is reflected in the smallness of production per laborer. Mr. Press comments on this as follows:

"The grain output in the United States in 1904 was 2,628 pounds per person, and only 954 pounds in Russia. In the industries the yearly product of one laborer in 1900 amounted to $2,377, and in Russia to $633. The average earning of the American laborer in 1900 was $425, while the Russian workingman during the same year received the munificent sum of $100 on an average."

Golden Future If—— With proper means of transportation and better tilling of the soil by first-class machinery, the land could be made to bring forth annually almost untold wealth, a large majority of the population being naturally agriculturalists.

Once the soil could be tilled with profit, by means and with the help of the needed development in the field of transportation, a new era would be marked in the progress and prosperity of the country.

What Might Have Been. Had the Rail Road building policy of Russia been as liberal and energetic as our own she would today be feeding Western Europe, and supplying those from whom she now buys.



TYPICAL MODERN AUSTRIAN LOCOMOTIVES

THE AUSTRIAN AND HUNGARIAN RAIL ROADS.

A Rough Road. The steam horse, in forcing its way through the different countries of the world, has met no greater vicissitudes than in the twin nations, Austria and Hungary. Until 1870 there had been built but 5,950 miles of Railed Road in the empire. By 1880 this had doubled, and to day there are 26,000 miles, the empire ranking sixth in Rail Way mileage.

The private corporations have gradually sold their lines and the government owns approximately 70 per cent of all the mileage.

Rail Roads Opposed. When the introduction of Steam Roads was first proposed, the opposition was bitter. In 1836, however, Baron Rothschild, of the famous house of that name, procured a charter for a line from Vienna into the province of Galicia. Austria thereby became the fifth

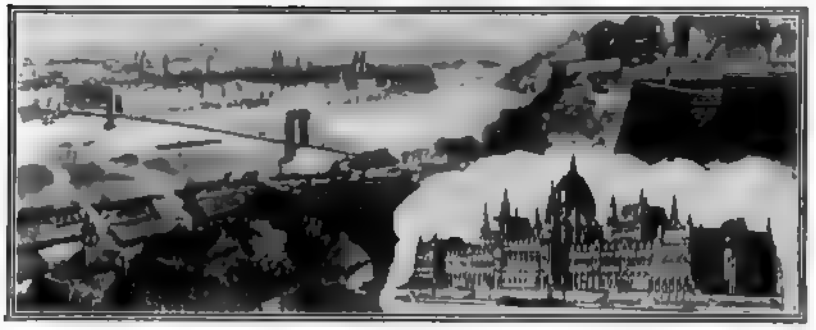
European state in which a Rail Road was built, England, Belgium, Germany and France preceding her.

Later, plans were made for a general Rail Road system. The lines were constructed with the European idea of having the ruling house control the people by controlling their communication. Complete government ownership was attempted soon after the Rail Roads became a factor. The panic of 1857, however, compelled their disposal at a heavy sacrifice.

Income Guaranteed.

To induce private capital to invest, and thus enable the system to be completed as planned, the government guaranteed that the receipts of the roads should reach a given sum.

Another panic came in 1873, our own great panic year. The depression following, together with German competition, resulted in the guarantees becoming so burdensome that the nation had again to adopt the roads.



BUDA-PESTH, HOUSES OF PARLIAMENT

Austrian Rail Road capitalization is about $112,000 per mile, and that of Hungary $63,500, the average capitalization of all being about $95,600.

Cost per Mile, $2,083,300.

The Tauern Road, the new Alpine line connecting Gastein and Spittal, which was opened in 1909, cost $62,500,000 to build, though only 30 miles long, the cost per mile being $2,083,300 per mile. Eight years were required to complete the Tauern tunnel on this line.

The Deficit.

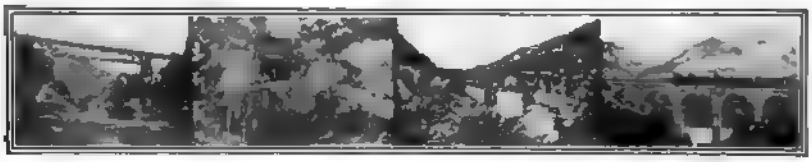
In 1906 the people of Austria-Hungary were required to make good a $16,850,000 deficit caused by the operation of the state Rail Roads. If capitalized, this deficit would increase the capitalization to a figure that would astonish even a Teuton. Operating expenses are increasing at a greater rate than revenues.

The keenest rivalry exists between the business interests of this dual nation. Each state endeavors to prevent the trade of its sister state from gaining a foothold in its territory.

A Bar to Progress.

Local opposition has prevented the building of many miles of Rail Road which would have developed business to such an extent that the millions who now seem only to wish money enough to get to America would be devoting their energies to the upbuilding of their home towns and cities and to the widening of the nation's markets.

Along the same lines it may be noted that politics have hampered and hindered attempts to operate the system on a thoroughly business-like basis.



TEICHE BRIDGE. NEAR BRUENN. ISONGO BRIDGE. HOLLENBURG VIADUCT.

The United States vs. Austria-Hungary.

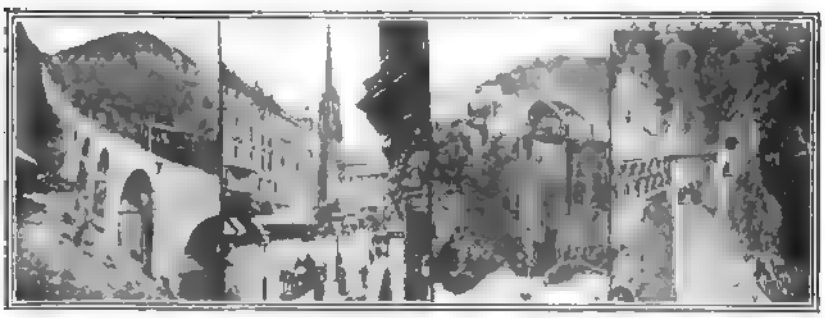
A Nation vs. a Company.

Light is thrown on the internal activities of the two countries when one considers that our Pennsylvania Rail Road system transports each year about 34,000,000,000 tons of freight one mile, as against 12,000,000,000 tons hauled by the Austro-Hungarian Rail Roads.

The total tonnage of the Rail Roads of Austria-Hungary is but 35 per cent of that credited to the Pennsylvania. Yet the Austrian Rail Roads receive $166,000,000 for their service, while the Pennsylvania for doing almost three times as much business receives only a small percentage more. The Rail Roads of the empire haul 702 passengers and 1,329 tons of freight over each mile daily, at a cost of $26.47.

High Rates.

The average rate for hauling a ton of freight one mile is about 1.30 cents, 71 per cent in excess of the American rate.



MENDELPASS RY. IN VIENNA TRISANNA VIA[illegible] VIADUCT.

When the "zone system" was adopted, it established a series of rates for distances of 3.1, 4.5, 6.2 and 8.1 miles; other zones of 93.1, 186.3 and 372.6 miles respectively covered the rest of the empire.

Lower Rates; Then Higher.

Its adoption resulted in a 40 to 50 per cent reduction in passenger rates, but stimulated travel considerably. The government in 1909 elaborated a plan to increase the passenger revenues by changing the zones, and an additional zone of 248.1 miles was added. Freight zones have also been changed to 31 and 93.1 miles and one rate beyond that distance.

This plan, if adopted in the United States, would wipe out the equal opportunities of all sections, regardless of their location, which we maintain as the policy and cardinal principle of rates, a policy which has created much of our prosperity, has greatly tended to increase our progress and has built and broadened our activities and opportunities.

SIMPLON PASS AND BRIDGE OF GONDO, CONSTRUCTED BY NAPOLEON, 1801-6.

ITALY.

First Italian Rail Roads.

The first Rail Roads in the present kingdom of Italy were commenced in 1853 in Lombardy, which was then an Austrian province. Italy has to-day 10,704 miles of Rail Roads, less than the mileage in the state of Pennsylvania, Texas or Illinois.

The State and Nation.

The roads were constructed by the Italian states when many of them were independent. Each state followed a different policy, the only one on which all agreed being the localization of traffic so as to confine it within its own borders; even physical connections were few

Lacking Unity.

Upon the unification of Italy the Rail Roads were connected, but the decentralized policy that had existed before the consolidation continued, and the conditions are said to have grown gradually worse.

Aside from the unsatisfactory financial results, the service is notably bad. During one month recently, out of 1,000 passenger trains, 486 were an hour or more late. Shippers and consigners of freight are constantly complaining of high charges, delays and losses of goods in transit, and generally harassing conditions.

Remedies Needed.

For years Italy has tried strenuously to improve the operation of her Rail Roads, but, as Senator Colombo pointed out in 1907, the government has applied only palliatives and has not tried remedies, pleading that the sums required for thorough treatment are too great.

Reconstruction, with easier gradients, tunnels, many cut-offs and much double tracking, is necessary.

A long step was taken, however, when laws were passed in 1907 appropriating more than $100,000,000 to be used in the ensuing five years for extensions and improvements. The new construction proposed aggregates 1,000 miles.

Experiments in Management.

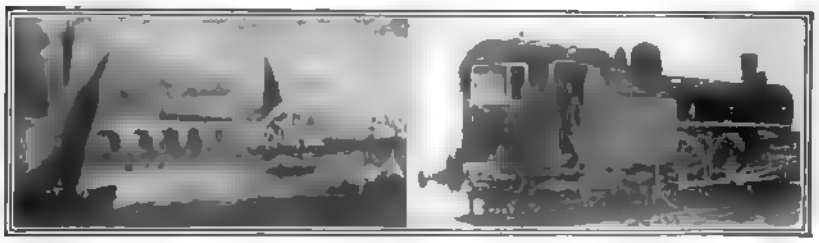
After the state's initial failure to operate the system satisfactorily, the lines were leased some years ago to private companies, the state guaranteeing earnings. The only notable result of the change, which was regarded merely as a test, seemed to be a big deficit to the government, and the leases were not renewed.

Then, in 1885, three companies were persuaded to take over the roads, to operate them on purely business principles. The lease was for sixty years, either party having the privilege to give notice of change after twenty years.

This notice duly arrived in 1905, the patience of the companies, as of the government, being exhausted. The government was still losing $2,000,000 a year interest, and the companies had made no profit.

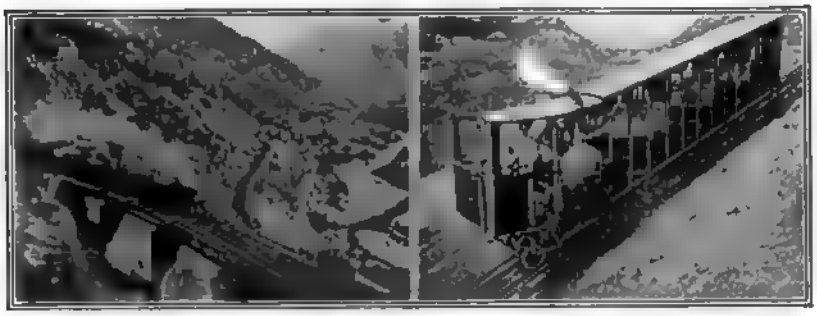
Rates Exceed Ours.

Though the financial results were so disastrous, it was not because the shipper was getting any benefits. Freight rates advanced from $1.58 a ton per 100 miles in 1899, to $2.30, three times the cost in the United States



EARLY RAILWAY VIADUCT TO VENICE

ITALIAN LOCOMOTIVE



SCENE ON THE ST. GOTHARD LINE. ON THE PILATUS FUNICULAR COG RAILWAY

The first-class passenger fare in Italy is 3.9 cents on express trains, on which the hourly speed averages 30 miles, and 3.6 cents on ordinary trains. When circular tickets are bought, the prospective passenger must furnish a photograph of himself.

Robberies of Baggage.

The tariff on baggage is 40 cents per 100 pounds for 62 miles, none being carried free. Robberies are said to occur frequently. This and the many tips exacted increase travel cost considerably, especially as the clerks at the ticket offices are said by Baedecker to make frequent "so-called mistakes when returning change."

SWITZERLAND.

First Swiss Line.

The first Rail Road in Switzerland, from Zurich to a nearby resort, was built in 1847, mainly to accommodate tourists and the small local freight traffic.

The St. Gothard line, with its famous tunnel, opened in the early '60's, was the first direct Rail Road route between Italy and Germany.

Switzerland affords interesting facts, because it exercises so complete a state control over its Rail Roads, which have a mileage of 2,763, a little more than one per cent of ours. Owing to the mountainous character of the country and the restricted trade, the Rail Road requirements, as to mileage, are substantially filled.

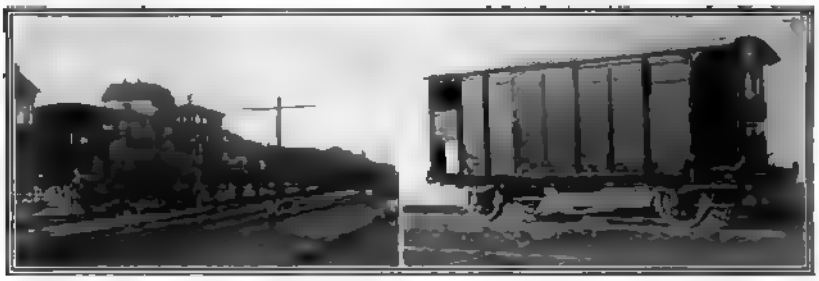
$107,750 a Mile.

The Rail Roads had, in 1909, a capitalization of $297,767,931, or about $107,750 a mile.

Switzerland's 22 states have, combined, less area than single counties in California, Colorado, and Texas. And with less than one-third of the area of New York state, and a population of 3,500,000, it has something less than one-third of the Steam Road mileage of the Empire State.

A provision in the charters enabled the state to acquire the private lines after a term of years.

The Federal government began to take over the lines in 1898, and in 1903 began operation of the first of these roads. The last of the great roads, the St. Gothard, was not taken over until May, 1909.



Swiss Goods Train Swiss Goods Car.

The Terms of Purchase. The purchase price was determined by estimating the ten-year average of net earnings as four per cent of the capitalization, but it was agreed that the figure so estimated was not to be less than the cost of construction.

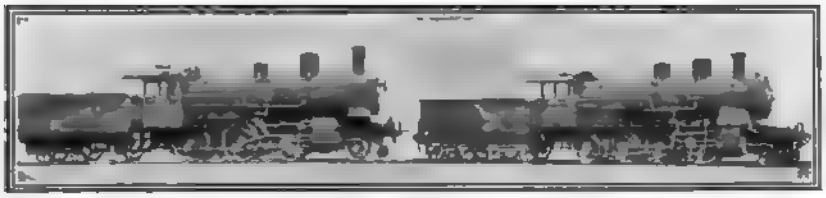
The roads were capitalized originally at $105,000 per mile; the purchase price was slightly above this.

Low Wages; High Rates. The wages of Rail Road employes in Switzerland are so small that they would not tempt an American section hand to take a position as engineer or conductor.

Notwithstanding these low wages, the Swiss Rail Roads charge an average of $2.82 a ton per hundred miles for freight, almost four times the American rate.

Congested Population. The population is greatly congested, and, considering its large barren glaciers and its great mountain areas and peaks, there is left a comparatively small portion of arable area. Many of the tiny farms seem like pocket handkerchiefs, laid out upon the mountainside to dry, and the Swiss cultivate almost perpendicular tracts of ground that Americans would think it impossible to utilize.

Interior Third Class Car Elaborate Coupings Sleeping Compartment.



IRON HORSES, SWITZERLAND.

Primitive Transportation.

In some cases the farms are reached only by paths so steep and narrow that supplies and crops or produce are carried out and in, in large baskets upon the backs of men and women.

In Switzerland government ownership ended competition, so that economic management, with a view to granting cheaper rates or meeting rivals, is not a necessity, and does not seem to enter into the plan of operation.

$100,000,000 Loss a Year.

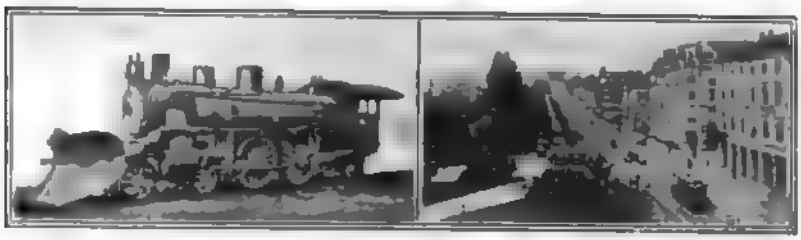
If the roads pay, state revenues increase; if not, the people will be taxed to make up the losses. And that the people do pay, is shown in the fact that with less than 2,500 miles operated in 1906, the budget showed a deficit of $925,000, and in 1908, of $1,200,000; this, without considering the interest on the $240,000,000 bonded debt. At this rate our Rail Road mileage would show a loss, if belonging to and operated on behalf of the people, of about $100,000,000 per annum, at freight rates nearly four times as great as ours.

High Rates for Foreigners.

The high-class Rail Way accommodations used by foreign tourists come high, and lower-class accommodations low. Ordinary first-class rates are 3¼ cents per mile, second-class 2¼ cents, and third-class 1⅝ cents. Baggage is charged for at the rate of 1 cent a mile for each 220 pounds. Only 22 pounds of baggage are carried free.

Season Tickets.

When season tickets, good for an unlimited number of journeys over certain lines within a limited number of days are ordered by letter, an unmounted photograph of the passenger must accompany the order. The rate on season tickets ranges from about 50 cents to $1.25 a day.

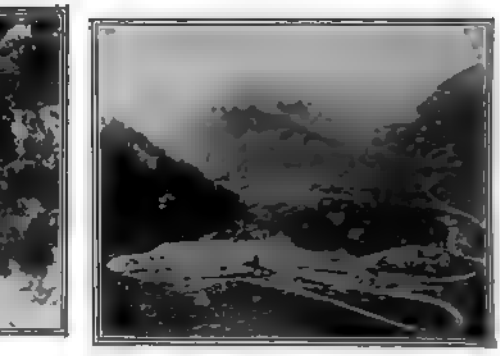


SWEDISH LOCOMOTIVE CHRISTIANIA.

Unattractive Coaches.

The fourth-class Swiss passenger car does not offer many attractions. Its inviting commodiousness in America would hardly be envied, as it looks more like a stock car than a passenger coach. As in other parts of Europe, "the low passenger rate made to please the people is pointed to with pride, but the farmer, miner and manufacturer have to pay high rates upon grain, fuel and merchandise to make up for it."

THE WINDING TELEMARKEN ROAD, NORWAY.



CANAL LOCKS, BRANDES, NORWAY.

IN OTHER COUNTRIES OF EUROPE.

In Spain, Holland, Belgium, Denmark, Portugal, Roumania, Bulgaria, Greece, Servia, Norway, Sweden and Turkey, there was an aggregate of 35,993 miles of Rail Road at the beginning of 1909, one-seventh of the mileage of the United States.

The area of these twelve countries is about one-fourth that of the United States, while the population equals three-fourths.

It should be remembered in comparing the rates in these various countries with ours, that while supplies cost no more, wages, the most important item, are approximately only a third to a half as much as they are in the United States.

NORWAY AND SWEDEN.

Norway and Sweden, on the Scandinavian Peninsula, with 124,000 and 172,000 square miles, respectively, were a joint kingdom until 1905, when the former seceded. The Rail Way conditions in the two countries are very much alike.

The Land of Eternal Snow.

A Rail Road is now being constructed in Norway which will have its terminus north of the Arctic Circle, and reach the most northerly point bound by steel ribbons to the rest of the world Another and more important line is under construction between Bergen and Christiania, which passes for 35 miles through regions of almost per-

manent snow and ice. This road, it is said, holds the record of engineering and traffic difficulties in Rail Way construction. The cutting of the Gravehals tunnel took nine years.

The Iron Horse in Scandinavia.

Rail Roads were introduced into the Scandinavian Peninsula in 1854, when a Norwegian trunk line, 42 miles long, was built from Christiana to Eidsvold. Two years later the first Swedish Rail Road was constructed. To-day there are 8,321 miles of line in Sweden, and 1,608 in Norway. A number of the lines are narrow gauge. Plans contemplate the construction of a number of new lines in the next twelve years in Norway.

State and Private Lines.

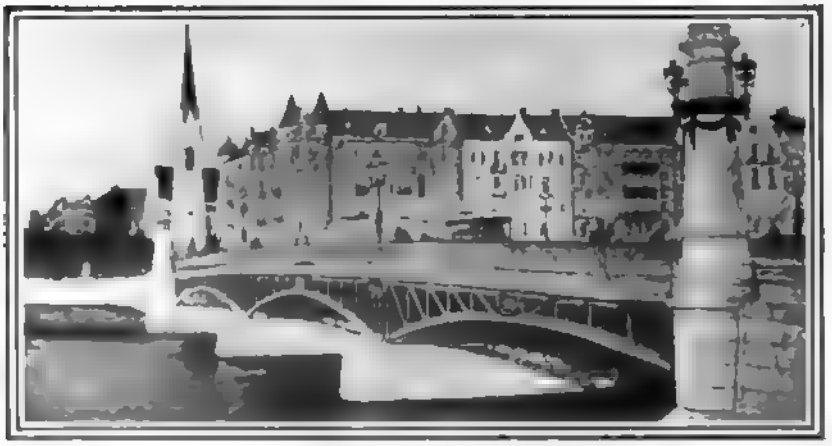
There are government and private Rail Roads in both countries. In Norway, one-sixth of the lines are privately owned; in Sweden, two-thirds. Some of the trains have second and third class only. Meals must usually be procured en route. As there are a number of disconnected Rail Roads, post horses must be provided to enable the traveler to reach the next Rail Road, which may be a considerable number of miles away.

The average capitalization of Rail Roads in Norway is $38,225 per mile, and in Sweden, $46,625 for the government owned and $24,400 for the privately owned roads. In Norway in 1908, the net earnings of the government lines were about two and a half per cent. The private lines earned three and a third per cent.

Knowledge Is Light.

The government has caused the majority of its 4,374 employes to attend a short course in an ambulance class, to give them some knowledge of first aid in case of accidents.

Sweden and Norway, owing to their shape, mountains and



STOCKHOLM.

geography, cannot concentrate traffic; but it is said that the average charge of $1.51 for moving a ton of freight 100 miles, two times our own rate, could be materially reduced. The rates of the two countries show differences, though these are only small.

Slight Variation.

Norway, with her much shorter mileage, charges 1.3 cents for transporting a passenger a mile, while Sweden charges 1½ cents; freight rates show a wider anomaly, but in favor of the Swedish shipper, who pays 1½ cents for having a ton of freight transported a mile, against 1.9 cents paid by the Norwegian shipper, or two and two and a half times the rate in the United States, respectively.

DENMARK.

Danish Mileage and Cost.

The first Rail Road in Denmark, a short line on Jutland, was constructed in 1847. To-day the 15,400 square miles of Denmark are served by 2,141 miles of Rail Road, the seventh greatest mileage to the square mile in the world. The state Rail Ways have an aggregate length of 1,189 line miles.

The cost of construction of these government lines is placed at $49,911 a mile.

There are no water ways of importance in the kingdom, and save for small craft no refuge or harbor along the western coast. Consequently the Rail Roads are doubly useful to the country.

State Gets Worst of It.

The lines were built partly by the state and partly by private companies, the latter putting in those that promised to return a profit, leaving the state to provide those thought likely to be unprofitable, although they were needed as much as the others.

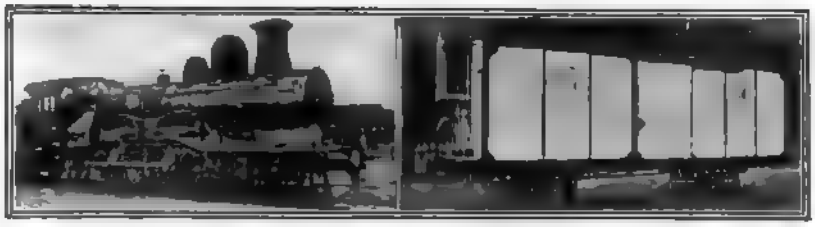
In proportion, as the agricultural population gained in political strength, it became more and more the policy of the government to operate the Rail Roads at or below cost. It is said that profit from operations came to be considered positive proof that rates were too high.

The Gains.

In the fiscal year 1897-1898, the state roads were operated at a profit of $1,172,706; in 1900-1901, the profits fell to $68,124; and in 1901-1902, there was a deficit of $58,392. For the year 1907-1908, however, the government roads show net earnings of $1,714,028. Gross earnings were $10,976,878.72.

The passenger rate is low. There is a special rate for each kilometer up to 100 kilometers—62.1 miles. The first-class rate for 50 kilometers is at the rate of 3 cents per mile; 100 kilometers, 2.9 cents per mile, and 200 kilometers, 2 1/5 cents per mile.

The cost of freight shipments is 2 cents a ton per mile, two and two-thirds times the American rate.



BELGIUM LOCOMOTIVE. GOODS CAR.

BELGIUM.

The First Line. The first Rail Road in Belgium—the Brussels-Malines—was opened to traffic in 1835. To-day there are 2,913 miles of line in the kingdom.

Belgian passenger rates are 2 cents for first-class, and 1½ cents for second-class travel. There are first-class carriages on none but through trains, but seats in those of the second-class may be reserved upon the payment of an additional fee.

Short Hauls. With an area only about as large as that of Maryland, Belgium has a population of 7,300,000, or 2,515 to the mile of Rail Road, and 27 times as many to the square mile as the United States. Its area is 11,400 square miles.

The Belgian traffic can best be compared with our cheap street car service, or our commuting Rail Road service, because of its short distances. The average receipts per passenger are 10 cents for an average journey of 14 miles, or 7 mills per passenger per mile.

Concessions. This low average is largely due to the special rates granted soldiers, officeholders, students, emigrants, societies, and what not, which practically amounts to the giving of rebates on passenger service. Of the 161,184,533 passengers hauled in 1907, there were 95,939,030 who traveled on special rates.

These classes, or at least the numbers who avail themselves of these rates, are so great that the average passenger receipts are decreasing. In 1900 the average receipt per passenger journey was 11 cents; in 1890 it was 14 cents, and in 1880, 18 cents. The average haul has changed little. These conditions are directly credited by those who have studied them to the government ownership of the Roads, and the use of them as political assets.

Baggage Tariffs High. But it should be borne in mind that the baggage charge is almost $2 for 220 pounds 100 miles. A moderate amount of baggage taken by a family of four from Antwerp to Spa would cost the equivalent of another ticket. Thus it will be found that Belgium's third-class rates are little, if anything, cheaper than second-class rates in Britain.

Getting Even on Baggage. Baggage tariffs netted the Belgian Rail Roads the neat sum of $450,000 in 1907, equal to about 60 per cent of the total receipts from first-class travelers.

Average freight rates are 47½ per cent greater than in America, being 1⅛ cents per ton per mile.

Capitalization. The capitalization of the government owned roads, about 95 per cent of all the mileage, is $478,705,932, or $187,950 per mile; this seems excessive in a level country, with no heavy or expensive construction, and with labor costing but a fraction of what ours costs. The result of such high capital is that each Belgian has to pay interest on about three times as much invested money as the American citizen on each mile of Rail Way.

Dog team, Holland.

HOLLAND.

In "Hollow Land." Holland, "hollow land," with 12,500 square miles and a population of 5,750,000, is one of the most densely populated nations on earth.

There are approximately 2,250 miles of steam roads, of which the state owns 1,160, which are none too well built. For travel within the country, i. e., on trains which do not run to points in other nations, the cars are fitted up very poorly.

Receipts Per Mile, $10,000. Receipts per mile average $10,000 a year, which is less than the average of American Rail Roads, although Holland's density of population is 18 times as great as that of the United States. The low figure is partially due to her extraordinary system of canals.

Owing to the great number of bridges necessary, construction has been costly, averaging $86,211 per mile. The average passenger rate is 1.39 cents per mile, but it costs as much as $1.14 to move a tone of freight 100 miles.

First-class passenger rates runs as high as 3 cents a mile, but reduced rate circular tickets are sold for from $2\frac{1}{4}$ to $2\frac{3}{4}$ cents per mile.

Passenger Rates High. For the privilege of riding in saloon carriages, the passenger has to pay 12 cents supplement for less than 90 miles, and 24 cents for greater distances.

SPAIN.

Spain's first Rail Road, the Barcelona-Mataro line, was opened in 1848. This was so successful that the government granted subsidies for further construction, and many lines were added between 1855 and 1865.

The total length of the system is about 9,250 miles, say one mile of line to every 21 square miles. The population is about 20,000,000.

Substantial Assistance. A Rail Road between Valencia and Madrid is nearing completion, with a subsidy granted by the government of $21,000 a mile, almost one-fifth the average capitalized construction cost, which in 1908 was computed to be $95,000 a mile.

EARLY AND MODERN TRANSPORTATION, SPAIN

Conditions of Yesterday. The Rail Ways of this country are said by guide books to be the worst in the world, and their backwardness seems a good indication of Spain's "Zeitgeist." Many of the inconveniences of the adventurous days of our Rail Roads exist to-day on Spain's modern way of travel. For instance, third-class carriages may be seen with seats on the roof; meals, except on a few special trains, must be taken at junction points, at a cost of 55 cents; and, as in some other countries of Europe, rugs and pillows must be hired at night.

Rates and Service. Service is slow and unsatisfactory. Ordinary trains average 15 miles an hour. Ticket offices open an hour and close a quarter of an hour before departure of trains. Sixty-six pounds of baggage are carried free, but it is said luggage is frequently robbed en route.

Fares are 2½ and 3⅜ cents per mile for second and first-class travel, respectively.

SCENE IN LISBON

PORTUGAL.

Portugal Backward.

Rail Road construction in Portugal commenced in 1863. Her Rail Roads are still very backward, only 1,700 miles to serve 36,038 square miles of territory and a population of 5,423,000. With an area equal to that of Indiana, and a population double that of the "Hoosier" state, Portugal has little more than one-fifth of the Rail Road mileage. And the character of the service would probably draw from the people of Indiana a strenuous protest.

The principal government lines, the South-Southeastern, 334 miles, and the Ninho & Dowro, 206 miles, were constructed at a cost of $37,245,000, an average of $69,972 a mile.

Passenger Tariffs.

First-class Rail Way fares are about 3½ cents a mile, and second-class, 2½ cents. The freight charge is 2.6 cents per ton per mile, three and one-half times our average. In this, as in other respects, conditions resemble those of Spain, though a little worse in some points.

The Portuguese colonies in Asia and Africa, with an area of 808,000 square miles, one-fourth the area of the United States, and a population of 7,256,000, have about 750 miles of Rail Road.

GREECE.

Haste Barred.

In Greece transportation has made little progress. About 800 miles of privately owned Rail Roads are in operation, partly under government guarantee of profit.

An extension to the Turkish frontier, 270 miles, was practically completed in 1909, and operation was planned to begin in 1910. It will make through connections with the Ottoman Rail Way to Salonica, and will be operated as a government enterprise.

Gauge. Many of the Rail Roads are narrow gauge, with consequently limited carrying capacity.

First-class Rail Road fares range from 3½ to 4¾ cents per mile, the latter rate obtaining between Valo and Lorissa, while from Tripolis to Kolamata, a route much traveled by tourists, the fare is 4 cents a mile. Parlor cars cost about 1 cent a mile above first-class fares.

Second-Class Equals First. Second-class fares are about 20 per cent less than those of the first-class, but there is practically no difference in the conveniences—or lack of them—afforded by the two carriages.

As a result, second-class passengers spend such parts of their journeys as they please in the first-class carriages. The comfort of ladies is ignored, for in all cars smoking is permitted.

Horseback vs. Steam Horse. Sixty-six pounds of baggage are carried free. As the Rail Road extends over such a small part of the country, it is necessary, in order to reach many points, to make use of horses, the hire of which is approximately from 70 cents to $1 per day. As the steeds make about 25 miles a day, this is at the rate of 3 to 4 cents a mile by a mode of travel which, owing to the poor roads of the country, is more uncomfortable than the worst possible Rail Road anywhere. To this figure, however, must be added the cost of additional meals and the value of one's time—if any.

BALKAN STATES.

Slow Balkan Development. Rail Road development in the Balkan States, sometimes facetiously called the incubator or hotbed of local revolutions, has been slow. At the end of 1909, Bulgaria had 995 miles to serve her 38,000

BINDING BY HAND.

square miles of territory, and more than 4,000,000 people; Roumania, 1,995 miles, to serve 50,700 square miles and 6,700,000 population. Servia, with 18,630 square miles, and 2,800,000 inhabitants, had 379 miles of state-owned steam ways, and the 6,130,000 persons in Turkey in Europe, which has an area of 65,300 square miles, were served by 973 miles of line.

To consolidate the statement, 4,342 miles of Rail Ways served an area three and a half times the extent of New York state and inhabited by 20,000,000 people.

Cost of Construction.

The cost of construction of the Servian Rail Ways was $24,350,000, or $64,248 a mile. The Roumanian Roads, which are state owned and operated, represent an average outlay of $89,276 per mile.

A Yoke of Buffalo, Turkey.

Bulgaria reports an average capital or cost of $40,565 a mile.

Freight Tariffs.

The Roumanian freight rates are 4.3 cents per ton per mile for five-ton loads, and 3.8 cents for ten-ton loads. Operating costs run 59 per cent of the total revenues.

Of the 639 locomotives in use, 531 are naphtha burning engines. The other rolling stock consists of 16,587 cars, of which 991 are passenger coaches.

Freight rates in Bulgaria are reported as 9.5, 4.7, 3.7 and 2.35, cents per ton mile, for goods forwarded independently, and 3.1, 2.5, and 1.57 cents per ton mile in five and ten-ton lots, with free housing for four days.

Construction Restriction.

Bulgarian laws forbid lines which would constitute prolongations of state lines, the connections of state lines, lines which would extend to the frontier, or which would connect with the Danube, points less than 18.6 miles from an existing station, as well as those which might compete with the state Rail Ways or prove harmful in any other way to the public interest.

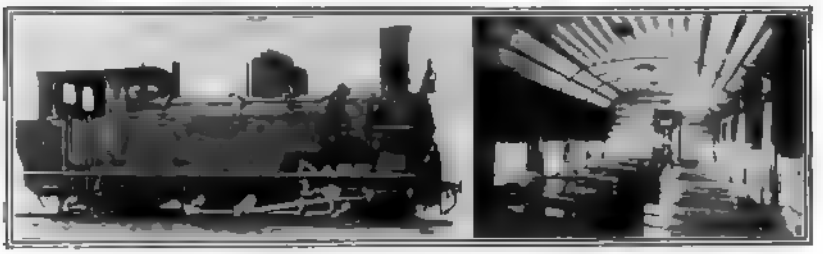
TURKEY.

In the Sick Man's Empire. Only since 1888 has Turkey been in direct Rail Way touch with the rest of Europe, although the first line—the Ottoman Rail Way—was commenced September 22, 1857. To-day there are 3,903 miles of line in the empire, of which 973 miles are in European Turkey.

European Turkey embraces an area of 65,300 square miles, and Asiatic Turkey 728,170 square miles.

English and German capital, principally, is invested, and with two exceptions, the roads have been constructed with a government guarantee of minimum receipts per mile. The amounts paid to cover the deficits are a heavy drain on the Turkish treasury, amounting in 1907 to $3,314,040, a 10 per cent increase over 1906.

To Add 6,000 Miles of Line. But Turkey has made up her mind to grow, to get her share of the world's progress and prosperity, and not to be handicapped by lack or excessive cost of mechanical transportation. The new regime is progressive, and has already decided on a loan of $80,000,000 to complete the Rail Ways begun under the old rule, and which it was planned to build by popular subscription.



LOCOMOTIVE, TURKEY IN ASIA. INTERIOR CAR

Bids have been asked on the first part of this loan, and it was intended to float $30,800,000 of it in 1910. The programme of the government contemplates 1,066 new miles in European Turkey, and 4,926 in Asia.

Egypt to Syria. There are other lines planned by private capital, among the projects being a line from Alexandria, Egypt, across the Suez Canal, and thence to Jaffa, in Syria.

The main lines of the Turkish system start from Salonica, Constantinople and Smyrna. Several Rail Ways run through the Holy Land, the Jaffa-Jerusalem line, 56 miles long, being the principal one. Its gross receipts for 1907 were $216,278, or $4,005 per mile.

Work for "Atkins."

In building the government lines out of Jaffa, the greatest part of the manual labor was done by the Turkish regular soldiery, without extra pay.

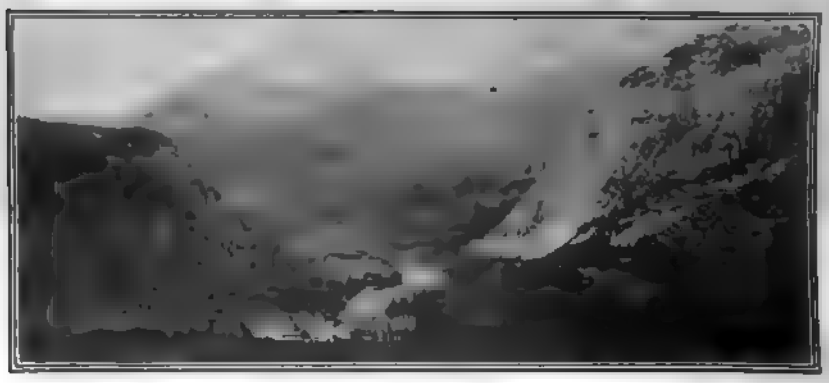
The rate of speed of Turkish trains is from 10 to 20 miles an hour in Asiatic Turkey, and 25 miles in European Turkey.

High Tariffs.

The passenger tariff for first-class travel is from 2½ to 5½ cents a mile.

The first class coaches used would not be regarded as luxurious in America. The most recent purchases were made in Germany, and cost the government $3,800 each, "laid down" in Damascus, which would hardly buy an American baggage car.

The gross receipts of 1907 of all Rail Roads of the Ottoman Empire were $10,190,117, to which the government added $3,314,040 in the shape of the guaranteed payments mentioned.



BASS RIVER VALLEY AND CANADIAN PACIFIC RAILWAY

NORTH AMERICA.

CANADA.

The Start.

Canadian Rail Road construction began in 1835 with the Champlain & St. Lawrence, constructed between La Prairie and St. Johns, Province of Quebec, a distance of 16 miles. Eleven and a half miles of this road are still in operation. The next line, the St. Lawrence & Atlantic, was finished in 1847.

In the eight years following the commencement, in 1852, of the Grand Trunk Rail Road, the nucleus of the present system, which is a consolidation of, or operates, 75 lines or branches, Canada's mileage increased 900 per cent, from 200 miles to 2,065.

12,675 Per Cent Increase.

In 1910 there were 25,731 miles, including that part of the Grand Trunk Pacific now in operation, an increase of 12,675 per cent over the mileage of 1852; the total trackage approximately 33,000 miles, including 1,211 miles of double track.

Steam power is used on practically all this mileage, but the electrification of the 460 miles of line from the St. Lawrence to Moncton is under consideration by the Grand Trunk Pacific.

To review, in 1860 Canada had 2,065 miles; the United States, 1,400 per cent more, or 30,625. Since then, Canada has added 23,000 miles; the United States, 206,000.

Fares and Rates.

The rates of the two countries are almost the same, the United States, however, having some advantage in lesser freight rates.

Passenger fares average 1.92 cents per mile, and each train carries an average of 54 passengers; the average journey is 61 miles. The freight rate averages .89 of a cent per ton mile. The average freight haul is 206 miles, 36 per cent greater than the average haul of 151 miles in the United States.

Earnings.

The earnings for 1910 were $173,956,217; operating expenses were $120,405,440. The net earnings show a return of 7 per cent on the capital liability.

One of the heavy items of expense is the removal of snow. In 1908-1909, a winter of light snowfall, the cost reached $993,694.55.

Six hundred and fifteen persons were killed, and 2,139 injured on Canadian Rail Ways in 1909.

CHATEAU FRONTENAC, QUEBEC STATION AT WINNIPEG RAILWAY HOTEL, VANCOUVER.

There were 123,768 employes on July 1, 1910, receiving a total of $67,000,000 for the year, an average of $542.

Government's First Road.

When, in 1867, the provinces of British North America, excluding Newfoundland and Prince Edward Island, became parts of the Dominion of Canada, provision was made to connect Quebec, Nova Scotia and New Brunswick. The Intercolonial Rail Way accordingly was extended, in 1878, from Quebec to Halifax, in Nova Scotia, 675 miles.

This was the practical beginning of the present 2,039 miles of federal and provincial owned Rail Ways, which have cost the government heavily.

Heavy Subsidies.

The [illegible] government expenditure on its Rail Ways prior to [illegible] was [illegible] since then the total of ex[illegible] has been increased to $[illegible].143,[illegible].

[illegible] from owned Rail Roads from [illegible]

Untempting Results

[illegible] earnings of the government roads [illegible] there was an ac[illegible] $1,[illegible] In [illegible] Four per cent [illegible] about $4,[illegible] per [illegible] did not take in as much [illegible] maintain the roads, to say nothing [illegible]

[illegible] and no taxes, the govern[illegible] lines to individuals at less [illegible] communities to make up the [illegible]

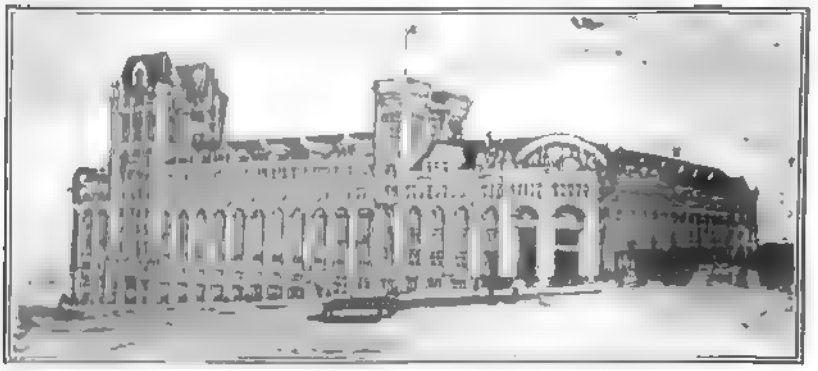
Extended Interest.

[illegible] actually owned, there are [illegible] the Dominion and Provinces [illegible] advances made which are [illegible] stock of the companies. In [illegible] was offset by $833,000 from the [illegible]

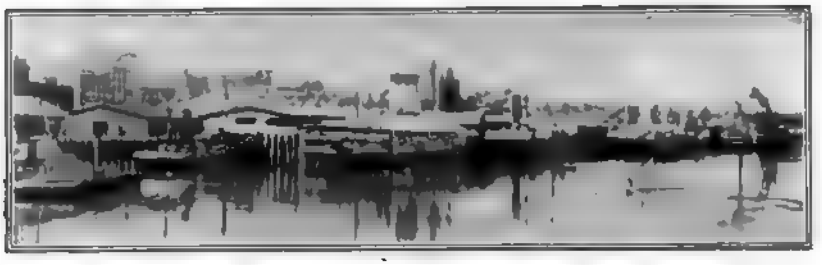
[illegible] the 24,104 miles of pri[illegible] or a total of $1,608,[illegible] 52,300,000 acres of [illegible] the cash equivalent [illegible] 18,000 miles of Rail [illegible] assistance, in either [illegible]

Spending Subsidies

[illegible] its stocks and bonds, [illegible] Canadian Pacific from the [illegible] $215,[illegible], of which $30,[illegible] subsidies from the



New Winchester Station, Mass.



WATERFRONT, VANCOUVER.

federal government. Other roads, likewise, have been liberally aided; in 1908 the Dominion Parliament authorized a government guarantee on $11,000,000 of Rail Way bonds and the payment of $5,000,000 in cash subsidies to the Canadian Northern. This was applied to 1,200 miles of new track.

Canadian Rail Road Holdings in the United States.

A Profitable Arrangement.

Possibly this generous treatment accounts for the ability of Canadian roads to acquire such large interests in Rail Roads of the United States.

The Canadian Pacific owns controlling interests in the Duluth, South Shore & Atlantic, and the Minneapolis, St. Paul & Sault Ste. Marie, the par value of these interests amounting to $46,900,000. The Grand Trunk controls six Rail Roads situated within the United States, the value of these interests being $16,718,666.

Incubator Failures.

Canada, like the United States, has had many projects which never passed beyond the "incubator" stage. In the 20 years prior to January 1, 1910, 203 charters were granted for projects aggregating 63,809 miles—something like three times the Dominion's present mileage.

Yet only 25 of these roads reached the construction stage, and most of these have been built only in part.

Nevertheless, the amount of Rail Way construction now going on in the Dominion is comparatively enormous. Two new transcontinental lines are being pushed towards completion, and in all about 5,000 miles were under construction on January 1, 1910.

These figures are better understood when one considers that the work under way equals the mileage under construction in the United States; yet Canada has but one-sixteenth the population of "The States."

A Powerful Board.

The Board of Rail Road Commissioners is composed of six members, and is a branch of the executive department, being appointed by the governor, in council; it has extraordinary powers, regulating even the speed of trains. Its rulings are final, subject to judicial review only upon questions of jurisdiction or law, when appeal

may be made to the Supreme Court, and also subject to review by the governor in council, in his discretion.

The commission's powers far exceed those of our Interstate Commerce Commission. It is a quasi-separate body from the Department of Rail Ways and Canals, which is headed by the Minister of Rail Ways and Canals.

Competition Prevented.

Our Rail rates have been reduced steadily as a consequence of competition; Canada prevents building even branches of one road into another's territory. In spite of the difference in policies, some economists question whether many of the best principles of Canadian Rail Road operation are not the production and consequence of their direct competition, in many directions, with American lines.

How Uncle Sam Helps.

So liberal and generous is the policy of our government, that Canadian Rail Roads are allowed to compete with American roads between American points, like Chicago and Portland, Maine, or Boston, between Detroit and Buffalo, and between New York and the West, via the Central of Vermont, and American goods go through Canada thus in bond.

Our marine laws will not allow a foreign ship, or one under another flag, to trade between two American ports in the United States, but we do allow Rail Roads under another flag to compete with our own carriers.

MEXICO.

Mexico, our nearest southern neighbor, was once known as the "land of the patient back," and even long after donkeys or burros were introduced from Spain, much of the transportation and carriage was done upon human backs.

Emancipating the Peon.

Peons, with bags on their backs, filled with broken ore, weighing up to 200 pounds, it is said, steadied by straps across their foreheads, climbed the crude mine shaft ladders of notched tree trunks sometimes for as much as 2,000 feet, and then packed the ore to the arastas.

The Days of Maximilian.

When in June, 1867, Maximilian was overthrown, there were in Mexico some tramways, but not a mile of steam-operated road.

One may now travel by rail from New York City to the southern border of Mexico, riding in Pullman cars the entire distance.

The Imperial Mexican Railway, connecting the capital with Vera Cruz, its seaport, was opened in 1873, but as late as 1880 Mexico had only 700 miles of steel way.

How the Rails Grew.

By 1890, however, the length had jumped to 6,000 miles, an increase of 800 per cent. There are now about 15,000 miles of completed Rail Way, of which 7,089 are government owned, while the total mileage owned or controlled, in whole or in part, by the govern-

ment, is placed at over 10,000 miles. Of the independent lines, ten have a combined length of 3,500 miles, 1,000 of this being the West Coast Mexican Extension of our own Southern Pacific. There are 39 other independent lines, ranging in length from 10 to 90 miles, and aggregating 1,000 miles or more.

In 1908 the roads of the country carried 10,747,128 passengers, and 10,042,144 tons of freight one mile. The gross earnings were $37,184,825 for the fiscal year.

Tariffs. The average freight rate in 1908 was a fraction over seven and a quarter cents per ton per mile; the average passenger tariff was, for first class, 4.8 cents per mile.

Mexican Finance.

The Mexican Rail Road merger, embracing 7,013 miles, a consolidation of the Mexican Central and Mexican National Rail Roads, became effective January 31, 1909.

The Mexican Central system, with the National and the latter's subsidiary, the International, before the consolidation reported a combined capital of $186,058,000 in stocks and bonds, and notes and script aggregating $286,110,524, a total of $472,168,524, or $67,327 per mile.

A Fertile Amalgamation. The combination issued $230,000,000 stock and $385,000,000 bonds, the total authorized capitalization being $615,000,000. In other words, the government capitalized it for $87,706 per line mile, an increase of 30 per cent above the capitalization prior to consolidation. The merger is expected to save $10,000,000 in operating expenses annually. These roads are capitalized by the government for very much more than United States roads are capitalized at by private interests.

The government seems to have issued securities under the merger agreement, amounting to $142,000,000 more than existed previously.

Responsibility vs. Profits. Under the merger plan the government, by indorsement, guaranteed both principal and interest of the general mortgage bonds, and received $8,450,000 bonds and $63,730,000 common stock. The government also received $51,272,290 in stock in exchange for shares in the merged roads.

The Mexican government usually stipulates that Rail Roads may become its property by purchase at the end of thirty-three years.

$100,000 a Mile. Rail Road building, despite very cheap labor, in many cases costs more than in the United States. In 1908, 42 miles of the Manzanillo branch of the Mexican Central cost practically $100,000 a mile.

To encourage Rail Road construction, the state and federal governments have granted liberal subsidies, and in many cases have temporarily exempted the companies from taxation, and from import duties on construction materials.

The Randolph lines, an extension of the Southern Pacific of

the Harriman system, already operate part of a line which is being built through the states of Sonora and Sinoloa, affording this region its first Rail Road transportation. The company has concessions for 1,500 miles, and is to receive about $10,000,000 in subsidies.

Rail Roads Make Modern Mexico.

It is hard to find another explanation for the gigantic forward strides taken by Mexico in the last quarter of a century than in the increase of transportation facilities, which encouraged the entry of foreign capital, much of it from the United States, enabling the development of Mexico's wonderful natural resources.

Almost a billion dollars of American capital are invested in Mexican Rail Ways, mines, lands, banks, stock raising, manufacturing and other enterprises. New Rail Road lines all through the interior are making possible the opening of mills and factories, the utilization of forests and the extension of mining, lumbering and other industries.

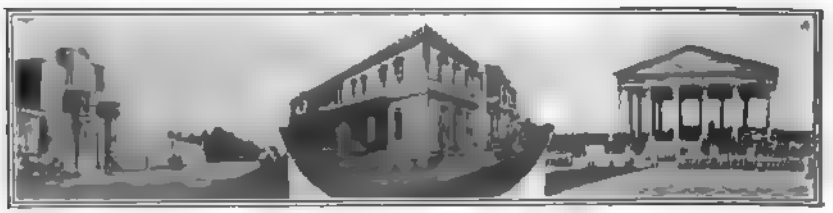
CENTRAL AMERICA.

Financial Uncertainty.

In Central America Rail Road building has not been active, owing to the losses which capital has been subjected to through uncertain conditions and frequently recurring internal dissensions. The governments, however, have generally been willing and anxious to grant land or financial subsidies. To serve the entire region, which has an area of almost 175,000 square miles and a population of nearly 5,500,000, an area four times, but a population only two-thirds that of the State of Pennsylvania, there are less than 1,350 miles of Rail Road.

Private Capital.

Practically all of the lines are privately owned and operated, but in a few instances there is some small government interest.



Public Buildings, Guatemala.

GUATEMALA.

Creating a Nation.

Pedro de Alvarado, a lieutenant of Cortez, conquered the Quiriche Indian kingdom of Guatemala in 1524. It was a Spanish possession until 1821, and was then part of the Empire of Mexico until the abdication of Iturbide and the formation of a republic.

With an area of 48,290 square miles, equal to that of Kentucky, and with an estimated population of 1,991,261, it has a Rail Road system of 480 miles, all of three-foot gauge.

The Connecting Links of Steel.

What may be termed the trunk line is the Northern Rail Road, extending from the Atlantic Coast to the Pacific. Sir William C. Van Horne, who completed the Canadian Pacific Railway, despite difficulties that seemed insuperable, and who built also the Cuba Central Railway, was one of the constructors of Guatemala's interoceanic line.

The Guatemala Central, on the Pacific slope, is considered one of the best Rail Roads anywhere on the Western Hemisphere south of the United States, and though narrow gauge, the roadbed is designed for standard gauge, and the change in the rails can be made at any time.

Arrangements have been made for the construction of two important extensions, to be in operation by 1911; one, thirty-six miles long, is to reach the Mexican frontier and connect with the Mexican road known as the Pan-American, and the other will reach the boundary of Salvador, 1,400 miles from the Panama Canal, to which, it is planned, the road will ultimately extend.

The completion of these will add another link to the Pan-American chain, and will open a direct Rail route from Salvador to the United States.

NICARAGUA.

The State's Position.

Nicaragua is the largest of the Central American countries, and its area of 49,200 square miles is greater than that of the state of New York; but the population of 600,000 is not fifteen per cent. of even New York City's enumeration; the Rail Road mileage, about 200, is only one-eighth of New York City's street car trackage.

Nicaragua's principal line, the National Rail Road, is of three feet six-inch gauge, laid with thirty- and forty-pound rails. It is 171 miles long, and extends from Corinto to Granada, and from Chinandega to El Viejo. The first section, connecting Corinto and Momotombo, 58 miles, was opened in 1884. It has been operated by a private company, under lease, since 1903. Receipts in 1908 were $2,251,233; expenditures, including repairs, were $2,369,962, leaving a deficit of $118,452. The number of passengers carried in 1908 was 825,576, and the average earnings per passenger were about 36 cents. The freight haul aggregated only 62,500 tons, and the average earnings were $7.75. First-class passenger fares approximate 4½ cents per mile. No figures have ever been compiled from which the average might be obtained, nor are any statistics available for computing the average freight rate per ton per mile. The latter, however, is very high, several times the average in the United States.

In the Yesterday.

It is said that at one time it cost 25 cents to ship a bunch of bananas for twenty-five miles over the National Rail Road of Nicaragua.

A 42-inch gauge line, for which a concession was granted in 1904, is nearing completion from Monkey Point on the Atlantic to San Miquelito, 118 miles.

PANAMA.

Times Stirring Men's Souls.

The Panama coast was discovered by Rodrigo de Bastida. The coast region was discovered by Columbus, and in 1513 the Isthmus was crossed by Balboa, the journey taking 26 days. After the general South and Central American separation from Spain in 1821, it became part of the republic of Colombia, from which it peacefully seceded in 1903.

Outside of the canal zone there is not a foot of Rail Road in Panama, although the area of the republic is 32,380 square miles and the population 361,000. The Panama Congress, however, late in 1909 authorized the construction of the Panama section of the Pan-American Rail Road, which was announced to begin in 1910.

Uncle Sam's Rail Road.

The Panama Rail Road, which traverses the canal zone, is 47 miles long. It extends from Colon across the Isthmus to Aspinwall. It was opened in 1855, having been built by Americans. It is now the property of the United States, having been acquired with other assets of the unsuccessful French canal corporation, which secured it from the original American owners.

The average freight earnings per ton per mile were 6¾ cents per ton per mile in 1909, or about nine times the average in the United States.

Other interesting phases of the operation of the Panama Rail Road are detailed in our Panama section on "Government Ownership."

HONDURAS.

Giving It Its Place.

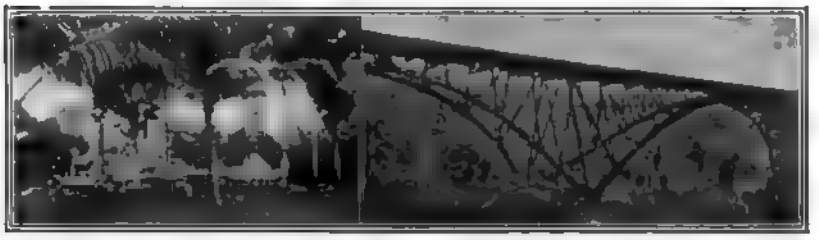
Honduras has a seacoast longer than from New York to Augusta, Maine. With an area of 46,250 square miles, equaling the combined extent of Pennsylvania and Rhode Island, her population is only 745,000.

Several years before the exploration of Honduras by Pedro Alvarado, Columbus discovered Cape Honduras and founded Trujillo. The coast furnished a favorite point of attack for buccaneers and pirates in the sixteenth and seventeenth centuries. In 1838, 17 years after the Spanish yoke had been thrown off, Honduras seceded from the Central American federation.

Beware the Waking Lion.

The Rail Road from Puerto Cortez to La Pimienta, a distance of 57 miles, was, until 1908, the only road in the country. In that year, 71 miles of the Honduras link of the Pan-American was built, a 32-mile banana Rail Road was opened, a contract was given for a road from Trujillo Bay to Juticalpa, with branches, the whole aggregating 350 miles, and minor contracts for 120 miles of small roads were also given.

It is worthy of note that the American Fruit Company is an important factor in the development of Central America, especially in Honduras, as it owns, controls and is building a number of lines.



ON GUATEMALA CENTRAL. PACIFIC RAILWAY, COSTA RICA.

COSTA RICA.

Larger Than Three States.

Costa Rica, with an area of 18,400 square miles, is nearly as large as the states of Massachusetts and Maryland. It has a population of 351,176, less than any of the Central American states. Nevertheless, its 400-mile system of Rail Roads is exceeded only by that of Guatemala in extent.

Columbus, on his last voyage, landed on the Costa Rican coast, October 5, 1502. The settlement he founded was wiped out by the Indians, and subsequent colonies were similarly treated until 1540, when a permanent town was commenced. Following the separation from Spain, Costa Rica was successively a part of the Mexican empire and of the Central American federation, becoming a republic in 1847.

The Few Roads Monopolized.

The country's Rail Road system includes a narrow gauge line 170 miles long, from the Atlantic coast to the Pacific. The Pacific section, 67 miles long, is owned by the Costa Rican government. The Atlantic section is operated by the Costa Rica Northern Rail Road,

an American corporation. This company also operates all the other mileage in Costa Rica, so that the Rail Road business of the country is practically a monopoly.

SALVADOR.

The Period of Construction.

The early history of Salvador is that of Guatemala, until 1841, when the republic was formed. In 1821 the people of Salvador adopted a resolution declaring for annexation to the United States rather than to Mexico.

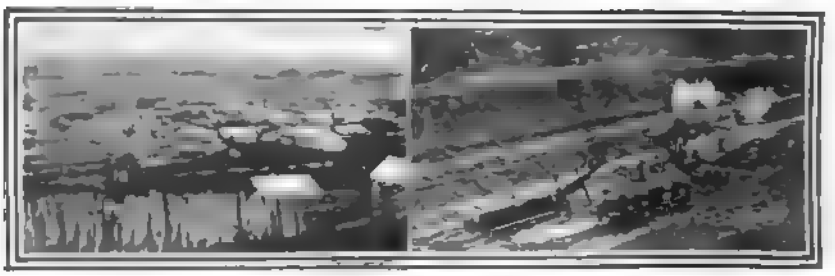
Salvador is the smallest Central American state, but second in population, having 1,707,000 people settled on her 7,225 square miles of territory. The population to the square mile—236—is about ten times that of the United States.

Little Modern Transportation.

The San Salvador Rail Way, extending from the Pacific Coast to Santa Anna, via the City of San Salvador, 104 miles in length, and a ten-mile road connecting San Salvador and Santa Tecla, constitute the present Rail Road system of the republic.

A line is projected to the Guatemalean frontier, where connection will be made with an extension of the Rail Road system of Mexico, thus opening a through rail route to the United States. It is planned to extend this road southward as far as Panama.

Freight rates are four or five times the American average, and first-class passenger fares are from three to five cents per mile. The capitalization of the system is unobtainable, but is placed at about $35,000 per mile for narrow gauge.



PUNTA ARENAS, THE SOUTHERMOST CITY OF THE WORLD, SO. AMERICA.

DIGGING THE CANAL WHICH WILL MAKE THE TRIP AROUND CAPE HORN UNNECESSARY.

SOUTH AMERICA.

Cutting Apart Binds Together.

Until the Panama Canal has been cut, South America will be physically connected with the United States. After the Canal is opened, contradictory as it may seem, we will be still closer to her, or at least to that portion lying on her west coast.

SCENES ON THE TRANSANDEAN RAILWAY

The reason is that then communication may be had with her West Coast from our own East, the richest part of the United States, without the long detour round the Horn, and interchange of commodities may be made without breaking bulk. We are bound together, not only by the ground and the backbone of the continent, which can only be "scratched," not severed by the Canal, but by the strongest bonds of mutual interest.

"America for Americans."

"America for the Americans," can and should be the motto of the three Americas, for there is little doubt in the minds of those informed in world politics that but for the shelter and firm assertion of the Monroe Doctrine, South America would have been the unwilling victim to the territorial expansion policy of the greater nations of Europe ere this, so that it probably would be at least a region of spheres of influence, if not actually seized by European powers, just as Africa has been partitioned, and as China is threatened by the foreign powers in possession of her very gates.

Europe's Desire.

A friend of the writer's, some years ago, talked with an army officer of a certain European power, which controls a section of the Dark Continent, and who was at the time in the interior of Africa.

"How do you like it here?" the officer was asked.

"Not very well," was the answer; "but we won't be here long."

"What do you mean? Where will you be?"

"In South America," was the reply.

This furnishes a key and index to what seems to have been the hope and desire of more than one European power.

Our Greatest Safeguard.

We will tell something of the greatest need of two great sections of the world, and the best preventive against any encroachment, in our article on the Pan-American Rail Way. In that section, also, we tell about the commercial conditions of the countries in this continent, the exports and imports, the principal industries, and other interesting details of their standing.

South America is but in her commercial infancy. She has millions of acres as rich as the best in North America; there is untold mineral wealth, and her future is just as bright as ours, provided she increases her means of internal communication, and either by a court of arbitration or a broad co-operative policy, discourages her internal dissensions, both intra and international, hitherto one of her greatest obstacles to stable government.

The Curse of Politics.

This has been a most serious obstruction to her advancement, and stood in the way of the full measure of outside investment, and of her full enjoyment of the progress and prosperity, which is hers by right of innumerable God-given blessings.

Fortunately, the personal or political selfishness from which many of these quarrels result is upon the wane. Hot heads, hot tongues, and too much politics have ever stood in the way of good and uplift, not only in South America, but throughout the world since man's activities began.

Let Us Get Together.

Let us hope for a better and better understanding with each new Pan-American Congress, and that the day will come when our brothers in the South will realize the true policy and feeling of their big brother in the North, when they will believe and rely upon our unselfish friendship; that they will realize that further territorial acquirement, unless in case of aggression against us, is the last thing in the minds and hearts of the government and people of the United States, that covetousness of our neighbor's goods is the least of our nation's sins, and that not our tenth, but our first commandment is "Thou shalt not covet thy neighbor's land."

COLOMBIA.

The republic of Colombia has an area of 438,436 square miles, equal to that of the states of Louisiana, Texas, Arkansas and Kansas combined, but the Rail Way mileage, 450 miles, is but 1½ per cent of the 31,000 miles in those states.

History. Colombia derives its name from Columbus, who, in 1502, sailed along her Atlantic coast for a considerable distance. Alonzo de Ojeda settled the Darien river region in 1508, establishing his capital, the present city of Bogota, on the site of the old Indian capital. Revolution broke out in 1810, ending in 1819, when General Simon Bolivar defeated the royalist forces.

Extensions. Much attention is being paid to Rail Road construction, and in 1908 concessions were granted for 1,570 miles, on much of which construction has commenced.

Under the law of 1892, Colombia is empowered to grant concessions for the construction and operation of Rail Ways and to subsidize the same at a rate up to $16,000 gold per mile, for a road of three-foot gauge. The subsidies are to be paid in revenue bonds redeemable out of import duties. The total of such bonds redeemed in any one year is not to exceed a fixed percentage of customs receipts, but the bonds are to bear interest until redeemed.

La Guayra and Caracas Railway, Venezuela.

VENEZUELA.

Its First Headline Event. Columbus, in 1498, on his third voyage, sighted the coast of what is now Venezuela, which occupies a third of a million square miles.

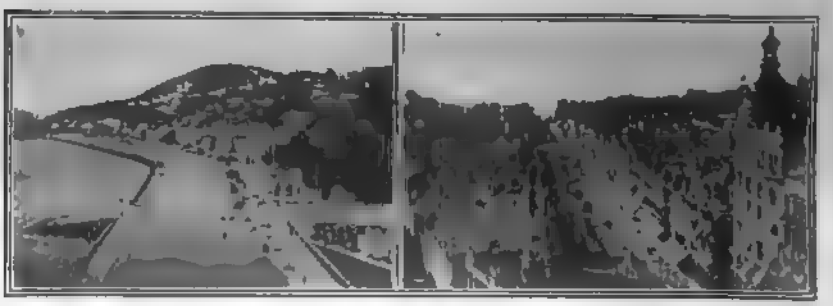
Other explorers penetrated the interior for short distances. There were then in the territory 150 tribes of In-

dians, speaking 11 languages and 160 dialects. The region passed under the jurisdiction of New Granada in 1818. Independence was secured when Venezuela, in 1819, became part of Greater Colombia, from which it seceded in 1830 and established its own government. The many troubles it has caused in various ways since, and particularly during the regime of President Castro, which ended in 1908, are familiar history.

Uneconomic Results.

In the republic 11 lines, aggregating 540 miles of Rail Ways, are in operation, with invested capital averaging more than $75,000 a mile. Receipts in 1909 were $1,864,712, and expenditures $1,185,820. Passenger fares range from 4 to 15 cents a mile, and freight tariffs particularly are heavy, that on merchandise being 17 cents per ton per mile on the principal Rail Road of the country. The coffee, cacao and barley rate on the same road is 12½ cents per ton per mile.

Many miles now under construction are being pushed rapidly to completion. It is expected that almost 1,000 miles will be in operation in 1911.



HARBOR AND STREET, RIO JANEIRO.

BRAZIL.

South America's Largest Nation.

The United States of Brazil is the largest republic in South America, and the second largest in the western hemisphere. In fact, excluding Alaska, the United States of America is about 200,000 square miles less in area than Brazil, which has a population of but 19,910,646, less than that of the New England and Middle Atlantic groups of states combined.

An American Emperor.

Pedro Alvarez Cabral, a Portuguese explorer, touched Brazil in 1500, and named the region "Land of the Holy Cross." The first settlement was made in 1549.

How Europeans vied for portions of South America is well illustrated in the case of Brazil. An unsuccessful attempt to wrest the country from Portugal was made by the Dutch; later the

French and English in turn endeavored in vain to secure the colony. In 1808, when Napoleon invaded the Iberian Peninsula, King John, of Portugal, moved his court from Lisbon to Rio Janeiro, and remained there until 1821, when he returned to Portugal, leaving his son, Dom Pedro, behind as regent.

The Yoke Thrown Off.

The separation movement was fostered by Dom Pedro, who, in 1822, proclaimed Brazil's independence of the mother country, and on October 12, that year, he was crowned its emperor. He reigned until 1831, when he abdicated in favor of his son, Dom Pedro II, who ruled Brazil until 1889, when he abdicated and a republic was formed, the revolution being a bloodless one.

Primeval and Primitive.

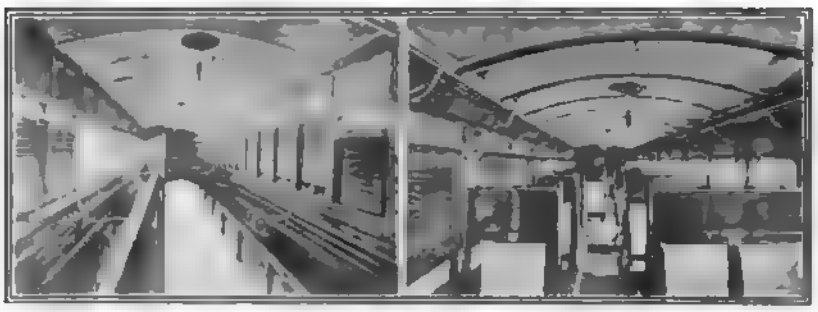
Parts of the interior of Brazil are said to-day to be less known or explored than any considerable area of even the interior of "The Dark Continent," Africa.

Brazil's present development of transportation facilities, relative to area and natural resources, is about on a par with that of the United States in 1840. Rail Road distances are great and traffic is small. Rates are high, and much dissatisfaction has been expressed. A strong movement has been launched by business interests of the republic for thorough revision of the rates.

Yet few, if any, of the Brazilian Rail Roads could continue operation, were it not for government subsidies, the government guaranteeing usually 5 per cent interest on capital, fixed in accord with various regulations.

Government Ownership.

One-eighth of the Rail Road mileage of Brazil is owned by the federal government, and one-third by various states of the republic. The remainder is under private ownership. The foreign capital is largely British, though there is some French and Belgian money invested



INTERIOR SECOND CLASS CAR, BRAZIL. INTERIOR FIRST CLASS CAR.

The grip held by England's exporters upon the import market of Brazil is understood when one considers that in 1909 it was estimated that $57,000,000 in British capital was invested in private Rail Way and industrial enterprises.

On to the Andes.

The Brazilian Rail Way policy looks forward to communication with the Andes, when immigration and colonization have advanced sufficiently in that direction to insure the exploitation of those vast and rich tropical regions. The plans for reaching the slopes of the Cordilleras, which would insure a junction with the main Pan-American line, are well matured.

The treaty of Petropolis, which settled the dispute with Bolivia over the Acre territory, will result in bringing Brazil, as concerns commercial and industrial intercourse, to the Bolivian Andes.

$10,000,000 for Rail Ways.

The $10,000,000 indemnity which Bolivia receives is to be used for Rail Way construction and other public works, in order to better communication and foster commerce between the two nations; but in addition to this, Brazil agrees to build within its own territory a 300-mile Rail Road, of which 56 miles was completed in 1909.

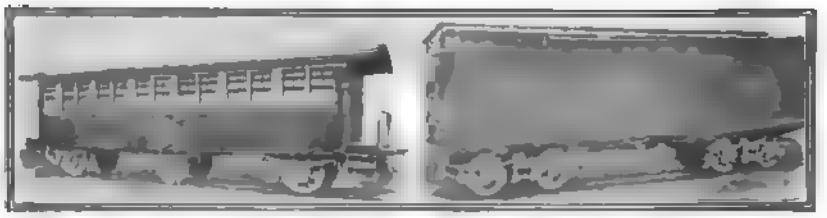
This road will be a prolongation of Amazon navigation to the Bolivian system of navigation and Rail Ways. It is to be leased to a syndicate, and both countries will have the right to the same franchises and tariffs in using it.

Capital Per Mile, $50,000.

The capitalization of the Brazilian roads was placed at $51,254,666.66 in 1907, when the mileage was 17,242.46 kilos, or 10,863 miles, an average of $47,185 a mile.

By 1909 the mileage increased to 19,226 kilos, or 11,940 miles, and the capitalization to approximately $50,000 a mile. The majority of the roads are narrow gauge, 3 feet $3\frac{3}{8}$ inches. On the line between Sao Paulo and Rio de Janeiro, broad gauge has been substituted, the work being completed in 1909, after several years' construction.

Almost 10,000 miles of Rail Road are under construction, or are projects which have proceeded as far as definite surveys and preliminary financing.



BRAZILIAN FIRST CLASS PASSENGER CAR. COVERED GOODS CAR.

IN ASUNCION, PARAGUAY

PARAGUAY.

Taking Out a Big Bite.

Notwithstanding Paraguay, with an area of 200,000 square miles, practically equals in extent the Gulf and Mississippi Valley group of states, its population of 636,000 is only equal to one-third that of Louisiana, which has the smallest population of any state in this group.

Paraguay for 25 years was known as a hermit nation. In 1865 the country had a war against the combined forces of Brazil and Argentine, one of the most desperate and sanguinary ever fought, from which Paraguay emerged in 1871, with 220,000 people, one-sixth of the population which she had in the beginning, the rest having largely been killed or died in the struggle, while those that were left were practically only the old men and women and children.

Beginning in Earnest.

The satisfactory settlement of the affairs of the Paraguay Central Rail Road—the only line in Paraguay—has given a new stimulus to the business of the country.

This is a broad gauge line, 155 miles long, and an extension of 77 miles has been surveyed and approved. It is to run to the Argentine boundary, where it will connect with the Argentine Northeastern Rail Road. It is to be a standard gauge line, and the gauge of the entire system is to be standardized and in operation by 1912. The capital cost per mile was placed at $68,200 in 1910.

Rates Soar Upward.

Passenger and freight tariffs were increased in 1908, and earnings for the year showed an increase, despite a drop in tonnage and passengers. Passenger rates now are 2½ cents per mile first-class, and 1¼ cents second-class.

Freight rates are divided into six classes, the rate for any commodity depending upon the class into which it falls and the distance carried, the rate per ton mile being less as the distance increases.

The total gross receipts for the year ended June 30, 1909, were $376,890; net receipts were $157,757.

Valuable Waterways.

Aside from the service rendered by this small rail system, Paraguay is dependent on its waterways for transportation. The Parana is navigable for 676 miles for vessels of 12-foot draft, and for 1,200 miles by smaller vessels. The Paraguay is navigable for 1,800 miles, much of that distance for vessels of 12-foot draft.

Paraguay is in especial need of east and west lines. A general law provides for subsidies of $20,000 per kilometer for construction work, including the rolling stock. This means $32,206 per mile. Concessions are also authorized on a basis of five per cent guarantee on a capital of $30,000 per kilometer, $49,000 per mile, the guarantee to run from 20 to 30 years. Concessions have been granted at different times for promising projects, but advantage has not been taken of them.

PUBLIC SQUARE, MONTEVIDEO. LEGISLATIVE BUILDING, MONTEVIDEO

URUGUAY.

Size and People.

The "Oriental Republic of Uruguay," the smallest South American nation, is larger than New York and West Virginia combined. It has a population of 1,111,758, or 15.4 people to the square mile.

The principal industry is stock-raising. In 1624 permanent settlements were made by Jesuits.

A Bone of Contention.

For two centuries Spain and Portugal each claimed the region, and alternated in occupying and evacuating the capital, Montevideo. In 1777, Spain's rights were recognized. In 1811 independence was achieved as part of what is now the Argentine Republic. Brazil occupied the country in 1825, but after war with Argentine, the independence of Uruguay was recognized.

Her Steel Roads.

There are eight Rail Way systems. Of the 1,273 miles in operation, 779 are under government guarantee, the total amount of capital guaranteed being $28,195,399. The gross revenues of the roads in 1908 was $4,362,666, with profits of $1,783,057. Work is progressing on several new lines.

A Contrast in Charges.

The average passenger rate is 3.9 cents a mile for first-class travel, or nearly double our own. The freight rate average is 3.7 cents per ton mile, or nearly five times our own.

Uruguay's Rail Way law of 1884, established definitely the outlines of the Uruguayan Rail Way system, and provided for roads of the standard 4-foot 8½-inch gauge.

The main provision of the law is a guarantee of interest on capital of $25,000 per kilometer—about $41,350 per mile. This interest was 7 per cent in the original law, but it has been reduced to 3½ per cent.

Fostering Progress.

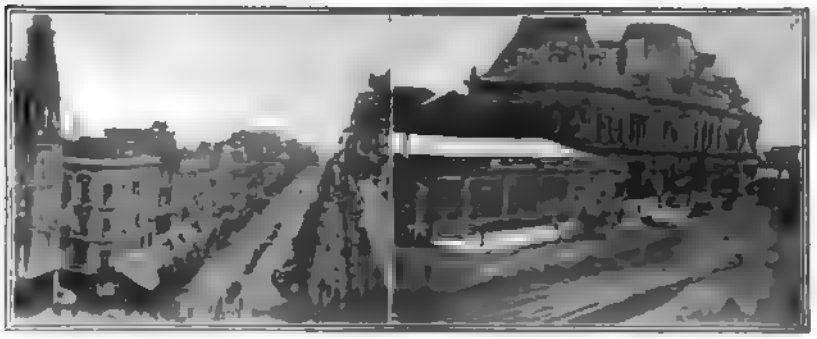
The law provides for exemption from trade and land taxes and for the free admission of material used in railway construction. The investment in all the Rail Ways of the republic, after the lines now under construction are finished, will be $98,000,000.

It may almost be said that the connection of Uruguay with the Pan-American system exists, as only a section of 22 miles is lacking for connection between the Uruguayan and Argentine Rail Ways.

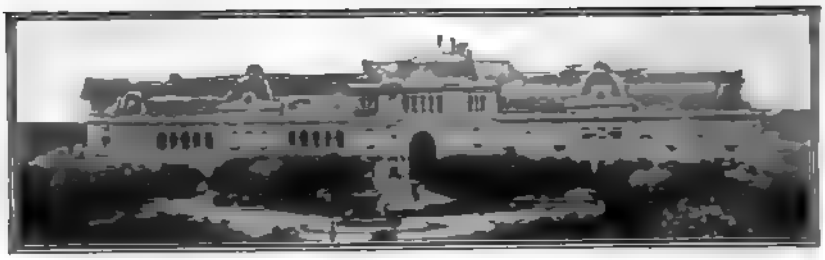
The Pan-American.

When this section is built, there will be direct communication from Montevideo to Jujuy, in Northern Argentina. The crossing of the Uruguay river at Monte Caseros, and the junction there with the Rail Way from Santa Rosa to Montevideo will make through communication possible.

The Central—Uruguay's corporation—is controlled by the interests that dominate the Southern Rail Way of Argentina, and the Buenos Aires and Rosario and Central Argentine Rail Ways. This fusion of interests is resulting in various extensions and branches of the Uruguayan lines.



BUENOS AIRES ARGENTINE. SOUTHERN RAILWAY STATION, BUENOS AIRES.



GOVERNMENT HOUSE IN BUENOS AIRES.

ARGENTINA.

A Nation in Fact.

In the markets of the world, the Argentine Republic is one of the great grain and cattle rivals of the United States. Her recent growth has been almost as phenomenal as that of our own country, and her excellent Rail Way service has enabled her to become an important international purveyor and factor.

Covers Much Area.

The Argentine Republic is the third largest of the republics in the three Americas, Brazil and our own country alone exceeding it in area. Its 1,135,840 square miles are equal to the area of the United States east of the Mississippi, plus the large states of Oklahoma, Arkansas, Missouri and Kansas. Its population of 6,805,000 is just a little more than the enumeration of New England.

Buenos Aires, the capital, has a population of 1,250,000, and is one of the handsomest cities in the world. The chief ownership of its electric street Rail Ways is in the United States. It has many costly edifices, and its new $2,500,000 Plaza hotel, is one of the finest and most completely appointed hostelries in existence.

When Hearts Were Bold.

Argentina, like the United States, has grown rapidly in population through emigration, cheap lands, the distribution of population and cheap freighting facilities given by her Steam Roads.

When searching for a passage to the Pacific Ocean, Juan de Polis, the Spanish navigator, sailed up the Rio de la Plata in 1508, and again in 1511. In 1526 Sebastian Cabot sailed up the Parana and Paraguay rivers.

Separation from Spain was accomplished in 1814, and in 1824 a president was elected.

Prosperity's Agent.

The first Rail Road in the republic was built in 1865. It had a length of 150 miles. The northwestern part of the country is to-day practically networked with Rail Roads; the Buenos Aires & Pacific now completed, establishes a much needed connection with Chile, and is the first South American Transcontinental Rail Road.

$51,000 a Mile.

At present there are in operation 15,476 miles of road, representing a capitalization of about $51,000 per mile. The lines reach north to Bolivia, west to the heart of the Andes, and south to what once was known as Patagonia. Many are of narrower gauge than our own, and most of them are built over prairie lands, where grading and construction costs are at a minimum. Electricity is employed as motive power on 306 miles of line.

The capital invested is largely English, German or French, which renders it difficult for American materials and American brains to secure recognition.

Fiscal Standing.

The profits of the Argentine Rail Roads have been increasing each year, from 3.62 per cent in 1903 to 5.10 per cent in 1908; the net income in the latter year was $40,023,000, receipts having been $101,393,000 and expenses $61,368,000; 48,593,600 passengers

ALFALFA ARGENTINE

SHEEP AT BUENOS AIRES.

and 31,000,000 tons of freight were carried. First-class passenger rates run about four cents a mile, but the average earnings per passenger per mile was 1.91 cents. The average freight rate per ton per mile is 1.78 cents, more than twice the average in the United States.

CHILE.

O'Higgins, of Chile.

General O'Higgins, who distinguished himself in the war of Chilean independence, was appointed supreme dictator of Chile in 1818, at the conclusion of the seven-year war for independence from Spain. He is regarded by his country much as we regard our "pater patriae."

The republic of Chile extends over 38 degrees of latitude, having a coast line 3,000 miles long, although the average width of the country is but 90 miles, about the distance between New York and Philadelphia. In other words, it is 33 times as long as its average width

Santiago. Pizarro took possession of the country in 1540, on the second invasion made by him into the stronghold of the Araucanians. His army, under Pedro de Valdivio, reached the site of the city of Santiago, which they founded.

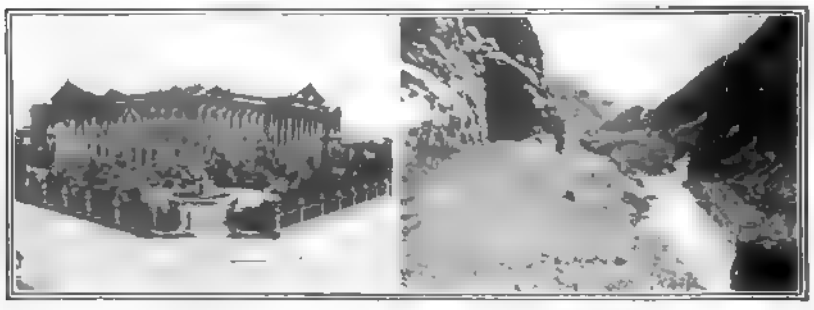
The Rail Way mileage of Chile was reported as 4,474 miles in 1909, of which 3,329 were in operation and 1,145 under construction. The state system reported 1,590 miles in operation and 870 under construction. Private roads reported 1,739 operating, and 275 miles under way.

A Great Hope. The entire Trans-Andean system is to be completed and in operation not later than March, 1911, and the tunnel on this line was practically completed in January, 1910. When the line is opened, it will be South America's first transcontinental. It will afford rail connection between Buenos Aires and Valparaiso.

The capital cost of the state lines was placed at $63,450 gold per mile at the beginning of 1910. Despite rates which exceed those of this country, the government has not yet reached the point where it can announce a profit; in fact, the losses seem greater each year. A loss of $7,590,712, gold, was shown at the close of 1908; the Central Line, having about three-fourths of the Federal mileage, was reported as providing 95 per cent of that deficit.

High Rates. The average first-class passenger rate in 1909 was two and four-fifths cents, gold; the average for all passengers was one and three-fifths cents. The average freight rate in 1909 per ton per mile, one and seven-eighths cents, is two and one-third times the rate in the United States, while the 1908 average of two and one-fifth cents per ton per mile was three times ours.

In February, 1909, contracts were awarded for 128 miles of road to a London company, and the contract for the completion of the 350-mile gap in the Arica-La Paz road was awarded in March, 1909, to a British firm. The Longitudinal Rail Way, north of Valparaiso, is being pushed by the government. A great deal of tunnel work is being done on this line.



HOUSES OF CONGRESS, SANTIAGO, CHILE TUNNEL ON TRANS-ANDEAN RAILWAY

MOUNTAIN CLIMBING ON OROYA RAILWAY, PERU.

EXPOSITION BUILDING, LIMA, PERU.

PERU.

In the Land of the Incas.

The republic of Peru equals in extent Texas, Nevada, Utah, Arizona and New Mexico. It has a population of 4,500,000, or about six and five-tenths per square mile—less than a third of the density of the United States.

After several attempts, Pizarro, the explorer, reached the coast in 1532 with a handful of men. The vast empire of the Incas at that time extended over more than one-half of the South American continent. The Incas were highly civilized, with excellent political and social institutions.

The Conquest of Peru.

The capital, Cuzco, founded in 1043, was entered by Pizarro, who made the friendly, unsuspecting emperor his prisoner. The natives, accustomed to paternalism, meekly accepted the situation. After a mock trial, Pizarro put the emperor to death and enslaved the Indians, to be himself assassinated eight years later. Independence of Spain was achieved in 1821.

The First Rail Road.

The second Rail Road in South America was a Peruvian line, built in 1851, to connect the seaport of Callao with Lima, the capital.

In the republic there are now 1,471 miles of Rail Ways, of which 844 are owned by the Peruvian Corporation, Limited, an English company, capitalized at $100,000,000, which took possession of the lines in 1890 for a period of sixty-six years. This was under the agreement by which the foreign debt of the country was assumed. Other roads are under construction, and a road from Lima to Huacho, 157 miles, is projected at a cost of $3,600,000, gold.

Difficult Problems.

One of the greatest achievements in Rail Road building is to be seen in Peru. The Central Rail Way, which runs from Callao, runs beneath the high peaks of the Andes at an elevation of nearly 15,700 feet in the great Galera tunnel.

The line from Lima to Oroya reaches the altitude of 15,940 feet. It was built by Michael Grace, an American, and was long considered the world's most difficult and remarkable piece of Rail Road building and engineering.

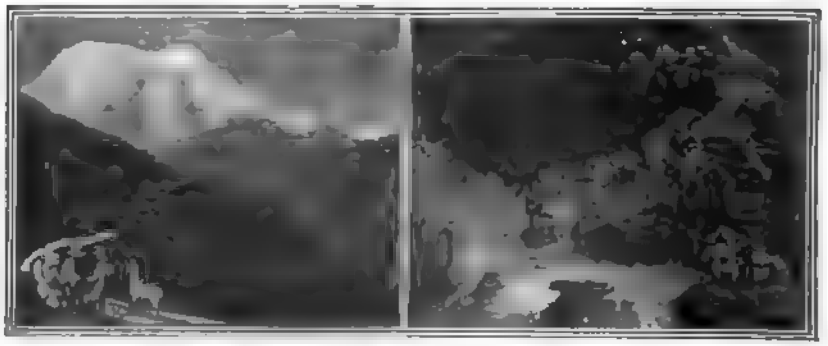
The extension from Oroya to Cerro de Pasco was built to foster the development of the great copper deposits of the Cerro de Pasco region, largely controlled by American capital. For 300 years these mines were worked chiefly for their silver, but they are now declared to contain the greatest copper deposits in the world. The output for the future is estimated at 60,000 tons a year.

The properties are owned by North American capitalists, the Haggin syndicate, which has invested about $15,000,000.

Coal. The working of the bituminous coal fields will follow; these will be of great commercial value because of the scarcity of coal for fuel in South America.

The average annual output of silver for a long period of years was 1,600,000 ounces, and from the time of their discovery in 1650 there is a credible record of 40,000 tons, practically 1,000,000,000 ounces, of pure silver extracted.

$170,000 Per Mile. The cost of Peruvian Rail Roads is high, the average being $122,700 per mile. The Oroya line, with many tunnels, cost $145,000 per mile; the line from Tacua to Bolivia averages $170,000 per mile. Approximately three-quarters of the cost of the Rail Roads was advanced by the Peruvian Government.



OVER THE ANDES, PERU. BALBOA ON THE ISTHMUS.

BOLIVIA.

An Inland Republic. Bolivia is one of the two South American countries which have no coast line. Much of the republic lies east of the Andes. Its area of 709,000 square miles is equal to the combined area of Washington, Oregon, California, Nevada, Utah, Idaho and Arizona, or, again,

equal to the New England, Middle and South Atlantic states combined. Its total population of 2,267,935 is but three and two-tenths to the square mile, as against 23.2 in the United States.

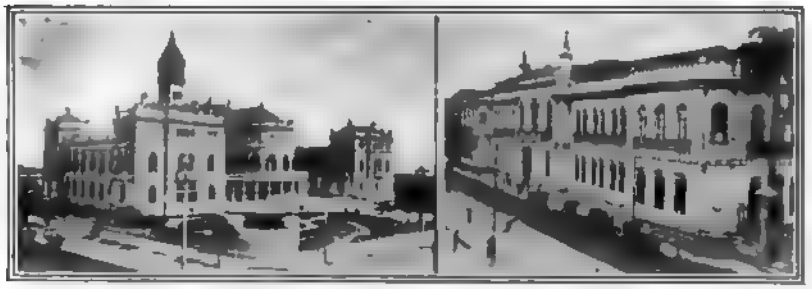
The country is largely a vast plateau, having an average altitude of 6,000 feet. The mountains abound in mineral wealth, and both tropic and temperate zone crops are cultivated successfully.

The Amazon River is navigable from Villa Belia, Bolivia, to its mouth, 2,516 miles; the Plata, Para and Paraguay rivers form another water way to the Atlantic, 1,740 miles long.

The Conquest by Pizarro.

Pizarro conquered the country in 1532. The first and last blood of the South American struggle for independence from Spain was shed on Bolivian soil.

The first Bolivian line, from Antofagasta to Solar, was built in 1873. The province in which that line lies was annexed to Chile after the triangular war of that nation and Peru against Bolivia.



CITY HALL, LA PLATA, ARGENTINA. GOVERNMENT PRINTING HOUSE, RIO JANEIRO.

The Mileage of To-day.

To-day there are about 800 miles of Rail Road, of which 400 miles are trunk lines, with many branches in operation, under construction or being located.

The $10,000,000 paid in 1903 to Bolivia by Brazil for the cession of the disputed Acre territory is now being spent for Rail Road construction and other public works.

The Pan-American.

Work on a 190-mile section of the Arica (Chile) to La Paz road is well under way. Of this road, 177 miles will form a link in the Pan-American; it is in operation in Chile to the Bolivian border. Its extension through Bolivia to La Paz is now assured, the Speyer City Bank syndicate of New York already having signed a contract with the government whereby the Americans furnished $15,000,000 and the Bolivian Government $12,000,000. The cost of construction has been estimated at $100,000 a mile.

In a Pullman.

A 1,200-mile trip can be made in this section of South America in a Pullman sleeper built in the United States. The journey takes 48 hours, or at the rate of 25 miles an hour. The fare is $2.10, gold, for every 100

kilos, or eight cents Bolivian—three cents two mills, United States money—per mile, the usual rate in Bolivia for first-class fares; five cents Bolivian is the second-class rate, or in United States coin two cents.

One Cent Down-hill, 2 Cents Up.

The freight rate on the Bolivian road from La Paz to Arica—downhill—is one cent (Bolivian) per kilo for each 100 kilos in weight; from Arica back to La Paz—uphill—the rate is double, or two cents per kilo for each 100 kilos. Charging double for an uphill haul is unique with Bolivia.

This is at the rate of 14.7 cents Bolivian, or 5.7 cents American money per ton per mile downhill, and 29.3 cents—11.4 cents in gold—per ton per mile uphill, and accentuates our contention in "Grades and Curves" that it costs more to haul freight up grade and over mountains than downhill or over level country. These rates are, respectively, seven and fifteen times our average.

COMPLETION OF GUAYAQUIL AND QUITO RAILWAY. ECUADOR.

ECUADOR.

Formulative Period.

Ecuador derives its name from being under the equator. It was the Indian kingdom of Quito when conquered by Pizarro. In 1542 it became part of Peru, and later half the region was transferred to the Spanish province of New Granada. It declared itself free in 1820.

The first Steam Road line in Ecuador, running 24 miles from Yaguachi, near Guayaquil, to Puente de Chimbo, near the foot of the Andes, was built in 1876. No attempt was made to extend this road until about 10 years ago.

To-day Ecuador has 316 miles of Rail Road to serve its 116,000 square miles of territory and 1,500,000 inhabitants.

Uneconomical Conditions.

The fertile highlands, that raise nearly all the products of the temperate zone, are separated from the tropical region near the coast by a distance not more than that between New York and Rochester.

Yet until the completion of the Guayaquil & Quito road it is said that the people of the lowlands found it less costly to import from Europe and the United States even such necessities as bacon, flour and vegetables than to pay the cost of bringing them by pack train over the ancient trails that alone led down from the highlands.

These trails in some places are hoof worn in the solid rock as deep as a mule's knee.

Cutting 15 Days to Two.

When the Guayaquil & Quito road, 287 miles, was placed in operation June 25, 1908, the time between the two cities was reduced from the original 12 or 15 days to two days. The trains on the Rail Road run only in daylight and put up for the night. When the first half of the Rail Road had been completed the cost for the trip from Guayaquil to Quito was $92.50.

Planning Development.

Surveys have been made for 92 miles of feeders to the road, and when this construction is well under way the Pan-American link from Quito north to Ibarra, 97 miles, will be undertaken.

IN BARBADOES. IN JAMAICA.

WEST INDIES.

Progressive Islanders.

Considering their area of but 80,000 square miles, and the population of 6,500,000, the West Indies are better supplied with Rail Road facilities than South America. Their people have been quick to adopt Rail Ways, and only six nations have shown greater readiness to employ this form of transportation.

The combined West Indian mileage in 1909 was 3,100, distributed as follows: 2,350 miles in Cuba, 218 miles in Jamaica, 152 miles in the Dominican Republic, 175 miles in Haiti and 200 miles in Porto Rico.

Cuba Awake Early.

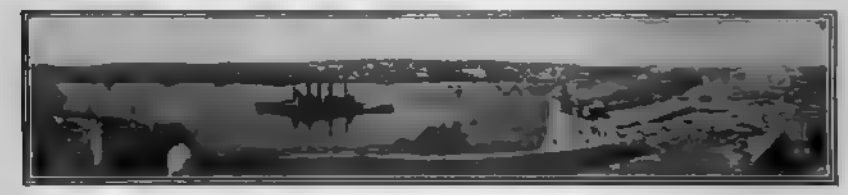
The first Cuban Rail Road, from Havana to Guanajay, was constructed in 1837. In Jamaica the first road, from Kingston to Spanish Town, was opened in 1845. The Rail Roads of the Dominican Republic, Haiti and Porto Rico were introduced in the late 80's and early 90's.

CUBA.

Cuba in size and population is about equal to Tennessee; even the same proportion of whites and blacks prevails.

A Subsidy of $9,700 a Mile

The Cuban Rail Road Company is building an extension from Marti to San Luis with a branch from Bayamo to Manzanillo, a total of 155 miles, the government granting a subsidy of $1,500,000—$9,700 per mile.



HAVANA FROM CABANOS FORTRESS

The entire length is expected to be in operation by May, 1911.

Net Earnings and Surplus.

The annual report of the corporation for the year ending June, 1908, showed gross earnings of $2,039,467.95, and operating expenses of $1,318,180.36, the net earnings figuring $721,287.59.

The cash surplus of the road was then $1,093,286.66.

The average charge for shipping a ton of goods one mile is four cents, and the cost of passenger traffic is also four cents per mile.

DOMINICAN REPUBLIC.

A Paternal Attitude.

The Dominican Republic maintains a paternal attitude toward Steam Roads. Its law provides that 30 per cent of the internal revenues shall be set aside for the payment of interest, up to six per cent, on capital invested in the building of Rail Roads, whether by private corporations or by means of funds which the government itself has borrowed.

Helping Out.

The law provides also a bonus of $2,000 per kilometer, or $3,221 per mile, for Rail Road building.

The principal Rail Road of the republic is the Dominican Central, 42 miles long, which was owned by an American company until 1908, when it became the property of the government. The other roads of the country, aggregating 110 miles of line, are privately owned.

HAITI.

The Pack Animal's Conge.

An American company is constructing two important Rail Roads in the republic of Haiti, the fellow tenant with the Dominican Republic on the island of San Domingo. One of the lines runs from Gonaives to Hinche, with a branch to Gros Mirne, 90 miles. The other runs from Cape Haiti to Hinche, and thence to Port au Prince, with a branch to Onnaminthe, a total of 200 miles.

These lines will open up the richest section of Haiti, hitherto inaccessible except by pack animals.

Construction Guaranteed.

The government guarantees six per cent per annum on the cost of construction, which is estimated at $24,194 per mile.

The road, however, probably will have a narrow gauge in a region where labor is cheap and timber for ties and bridges is at hand. Haiti's area is 10,200 square miles, and the population is 2,000,000.

JAMAICA.

Jamaica's Rail Road mileage is embraced in three roads, the Kingston to Montego being the main line, with a length of 113 miles; the others, which connect with it, join Bog Walk with Port Antonio and Spanish Town with Ewarton. The entire system embraces 218 miles.

Jamaica is 90 miles south of Cuba and is small, having an area of 4,000 square miles and a population of 700,000, only 15,000 of whom are white.

SCENE IN DAMASCUS.

THE ORIENT.

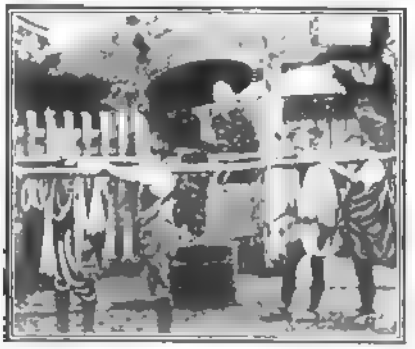
Yellow Men Awakening. Until 1900, except in the Russian and British possessions, and in Japan, Rail Roads had scarcely been introduced into Asia. Unprogressive or reactionary governments and superstitious peoples in some cases stood in the way. Since then, however, signs of interest, progress and activity have not been wanting, even in the most remote places.

Thibet Adopts the Rail Road. Mystery-shrouded Thibet, only recently penetrated by white men, seems to have been awakened to the importance of Rail Road transportation. Just before his flight, following the discovery of a plot to overthrow the Chinese control, the Dalai Lama requested the Chinese Government to authorize a foreign loan for the purpose of constructing a line from Chumbi to Lhassa.

The New Era. The awakening of the great Orient, by means of the Steam Road, will work the greatest commercial revolution the world has known, for it will bring more than half the people in the world into closer touch with western civilization, products and comforts.

When these peoples adopt, even to a limited extent, the habits, the food, the raiment and implements of western civilization, the world may truly be said to have entered on a new life.

At the close of 1908 there were but 12,500 miles of line in Asia outside of India, Siberia and Japan.



FIRST CLASS TRANSPORTATION IN JAPAN

JAPAN.

The Yankeedom of the East.

Rail Road Mileage. The Japanese, popularly called the Yankees of the Orient, have 5,000 miles of Rail Road, of which only a few of small relative importance are owned by private companies. About 1,500 miles of line are under construction.

The lines serve an area about three times the size of the state of Ohio, but Japan's population is more than 10 times that of the "Buckeye State."

$74,000 Per Line Mile.

The nationalization of 92 per cent of the Rail Roads of Japan, embracing 17 private lines with 4,452 route miles, was completed in 1908. In 1909 the roads were valued at $239,815,880 by government experts. This is treated of more fully in our section on "Capitalization."

The capital per mile of the government lines is $50,000, while for the 445 privately owned roads the capital outlay is placed at $39,000. The government, however, paid $74,000 per mile for the lines acquired by it. When present construction work is completed, the mileage will be: government, 6,192 miles; private lines, 542 miles.

Results of Operation.

On the face of the returns, the results from operation appear about as favorable as those obtained by American managers, but when the scarcely more than nominal wages are considered the American showing is far the best.

Operating expenses are 51 per cent of the gross revenue, against 67 per cent in America. The earnings average seven per cent on the investment.

Freight and Passenger.

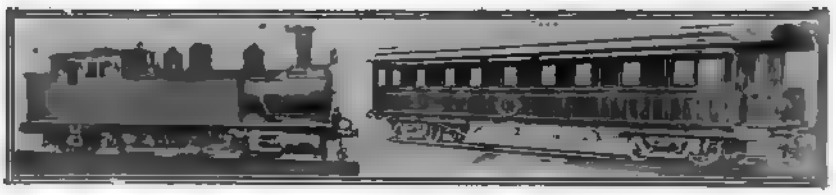
The average charge on freight is more than a third higher than in the United States.

Passenger rates are from 1.25 to 1.85 cents a mile first-class, three-fourths to one and one-tenth cents second-class and one-half to three-fourths of a cent for what is called third-class. But these passenger rates are not nearly so low in proportion to the earnings of the individual as in the United States. Besides, Japan has more than 10,000 people to travel on and support each mile of Rail Road, or 26 to 1, as compared with the United States.

Tokyo's "L" Road.

The city of Tokyo, with 2,085,000 people, has a comprehensive system of electric street Rail Ways and an elevated Rail Road. Nevertheless the "jinrikisha" is the favorite passenger carrier for short

MISAKI BOAT YOKOHAMA, JAPAN RICKISHA



JAPANESE ENGINE AND SLEEPING CAR.

distances, although the tariff is much in excess of Rail Way travel, and higher than "rikisha" rates in China.

Rikisha Tariffs. It is interesting, perhaps, to see what the rates of this human livery are, and whether Rail Way passenger rates are proportionately low. For a two-and-a-half-mile journey the charge is about 10 cents if pulled by one man; if two are employed, the charge is 20 cents.

By time, the rates are—for one man five minutes, five cents; 15 minutes, 10 cents; one hour, 25 cents, and one day (10 hours), 75 cents; with two men the charge is about 90 per cent additional, and in bad weather another 50 per cent is added. On a rainy day a jinrikisha with two coolies costs one 4.25 yen—about $2.25 American money—with an extra 10 sen every time a hill is climbed.

Results Not Brilliant. Wages are about one-tenth to one-twentieth of ours, as is related in "Foreign Rail Way Wages." Under the same wage scale, American Rail Roads could reduce rates about 33 per cent without impairing net profits; they could thus cut Japanese freight rates in half, but it would mean a reduction of the wages of nearly 1,500,000 people from dollars to dimes.

Formosa.

The Formosan Rail Way completed 1910, the first year of its operation, with a balance of $653,695. The system is virtually a present from Japan to the Formosan Government, inasmuch as the entire cost of construction and equipment was provided for by the central Japanese Government, which negotiated the five per cent $12,901,686 Formosan enterprise bonds.

Statistics. Summarized, the system comprises a total mileage of 271.3 miles, with rolling stock valued at $1,319,670, consisting of 54 engines, of which eight are American made, 112 carriages and 826 wagons. Revenue: Passengers, $615,119; freight, $755,867; miscellaneous receipts, $4,424; total revenue, $1,375,410. Expenditures, $721,715. The number of passengers carried in the year was 2,691,033, and the freight carried amounted to 710,460 tons. Persons employed on the line, 2,756; salaries and wages paid during the year, $281,840, an average of about $102 per employe, or $8.50 a month.

Extensions. It is planned to extend the system by two branches, 60 and 41 miles, respectively, in the eastern and southern parts of Formosa.

The estimated cost of the 60-mile line is $2,119,986, and the work was begun January, 1910. The Arisan line, 41 miles in length, is expected to cost $1,326,672, and the work was to have been commenced in May, 1910. The gauge for both lines will be 3.6 feet.

Besides the Imperial Rail Ways, Formosa has 298 miles of tramway in operation and 100 miles under construction. The tramways are mostly owned by the big sugar companies.

CHINA.

Americans in Chinese Roads.

The successful demand in behalf of American bankers, made in 1909 by the State Department of the United States, for an allotment by the Chinese Government of an equal share with three other nations of the Rail Road loan of $30,000,000, peculiarly directed American attention generally to the fact that the Flowery Kingdom is adopting modern methods and that the old superstitions against disturbing the graves of ancestors have given way to the call of progress and the demands of trade.

Foreign Builders

Heretofore practically all of the Chinese Rail Ways were built by foreigners, who procured concessions from the government; in all grants, however, there is the provision that at the end of 25 years the owners can elect to sell the roads to the government or to renew the concessions for 99 years longer.

The passenger fares on Chinese Rail Ways are two cents a mile for first-class, and one and one-half cents for second-class.

Rail Ways Popular.

Chinese have a remarkable inclination for travel and have taken readily to the Rail Ways. It is not uncommon to see second and third-class coaches packed four hours before the time for the train to leave. Some expectant travelers go to the station the night before and sleep on the platform. When the train backs in they get in, seeming to derive great pleasure from merely sitting in the cars.

The first-class trains are arranged with compartments upholsA ONE-WHEELED PASSENGER CART IN CHINA.

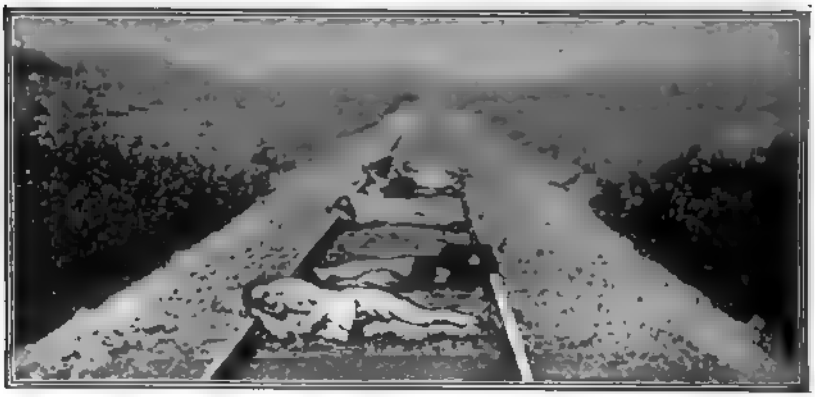
IRON BRIDGE HIMALAYAS

tered in leather, electric lights and up-to-date lavatories, while the push-button for food or refreshments brings the good service of competent Chinese boys.

Every five minutes the hot-towel coolie offers this means of refreshing face and hands, the towels being steaming hot and perfumed with eau de cologne.

Needle in a Haystack.

At the end of 1905 the Chinese Empire, with its 1,530,000 square miles of territory and population rising 450,000,000, boasted only 3,500 miles of Rail Road. Since then 1,000 miles have gone into operation, while some 5,000 miles are under construction, surveyed or projected. China is far behind the rest of the world in improved transportation, and each 85,000 inhabitants have only one mile of Rail Road, the people of the United States being served 243 times as liberally.



ASLEEP ON SHANGHAI-NANKING RY. THE TRAIN MUST BE STOPPED UNTIL THEY BE WARNED OFF.

Travel's Influence.

Much of the activity awakened in the ultra-conservative Chinese is due to Chinese returned from the United States. One of these, Chin Gee Hee, who was a section hand, then foreman and afterwards a subcontractor in America, has completed a 40-mile Rail Road from Sunning to King Yik, and will extend it 26 miles. In building the Sunning Rail Road, Chin, who spent 40 years in the United States, was helped by about 100 Chinese foremen and laborers, all graduates from American construction gangs.

Another important line, from Peking to Kiakta, on the Siberian frontier, is being built under the direction of Tao Tai Chau, a Chinese civil engineer educated in the United States.

Rebates.

Up to September 30, 1909, rebates to shippers were permitted. These were paid six months after the end of each year, according to the amount of business done. Forwarding agencies used this as a means of increasing their own business, the agencies offering to pay rebates im-

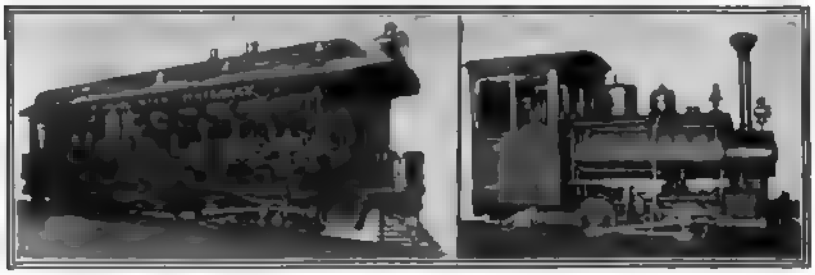
mediately on all aggregate shipments on which the freight charge totaled 10,000 yen ($5,000) or more, making no charge for their own services.

The agencies' bills, being so much larger than those of any shipper, received a greater discount and the margin enabled them to do a profitable business, but at a reduction in the revenue received by the Rail Road. The rebates allowed by the South Manchuria Rail Road Company in 1908 aggregated $115,635, gold.

Day Is Dawning.

Since the completion of the line to Kalgan, the appearance of long caravans in the streets of Peking has become less common than formerly. It is said that 700,000 camels were employed on this caravan route. As the Rail Road penetrates into Mongolia it will effect for Mongolia what our transcontinental lines did for the central and western states.

At the beginning of 1910 the Canton-Hankow Railway was operating six American locomotives and had 16 others ready for service. The six are moguls of 120 tons. In construction work four Manhattan locomotives were being used; these engines were formerly in service on the elevated Rail Ways in New York City. Of coaches and freight cars there were 30 American-type passenger coaches, one directors' car, 72 American freight cars, and 106 Chinese-made freight cars.



MANCHURIAN ENCLOSED LOCOMOTIVE. CHINESE ENGINE.

FRENCH INDO-CHINA.

A Texas in Asia.

French Indo-China, made up of Cochin-China, Annam, Laos, Cambodia and Tonkin, is slightly larger than Texas and has a population of about 18,000,000.

The French Government has constructed 725 miles of line, which radiate from Hanoi and Saigon, the capitals of Tonkin and Cochin-China, respectively. A line partially constructed will join these centers eventually, passing through and connecting the isolated coastal parts of Annam. To this trunk line various short branches have been built and others are contemplated.

Saigon to Mytho.

Rail Way construction in French Indo-China began in 1881, with the line from Saigon to Mytho, both of which are in Annam. This line traverses a low-lying country, where in the rainy season no land can be seen for many miles except the Rail Way embankment and the dikes of the paddy or rice fields. The soil is then a black, sticky mud, and even the Rail Way embankment is not very solid ground.

When not entirely inundated, the region is crossed by many bayous and other water courses.

Many Difficulties.

These conditions have made construction somewhat difficult and maintenance burdensome. Until 1891, when the trunk line toward Tonquin was undertaken, this remained the only Rail Road in Cochin-China.

Passenger rates are about one and one-half cents per mile for first-class and one cent for second-class. Wages are pitiably low.

Annamese Freight Rates.

Freight is classified under five series and charged for at the rates of 8.7 cents, 7.2 cents, 5.8 cents, 4.3 cents, and 2.9 cents per mile per ton, the first-class rate being 11 times and the last four times the average American rate.

Carload rates of 11,023 pounds are determined by transferring from the series in which the commodity belongs to the next lower series. In the fifth series the carload charge is reduced to 2.1 cents.

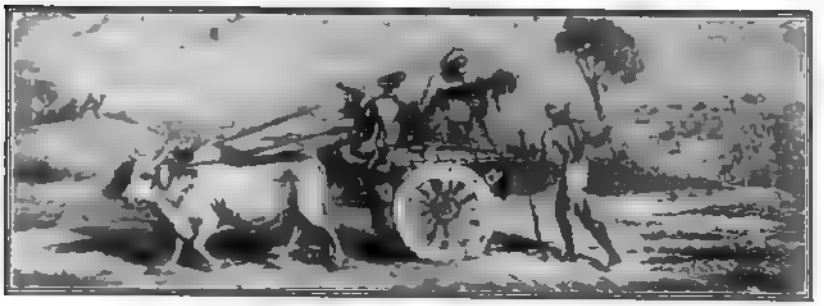
If a shipment weighs only 440 pounds to 35 cubic feet or less, the charge is doubled; and if below 110 pounds, it is classified in the first series.

BRITISH INDIA.

More Rail Roads Needed.

With an extent of territory about equal to the great interior basin of the United States east of the Rocky Mountains and west of the Alleghenies, and with almost six times as great a population as that region, British India, in March, 1909, had 30,809 miles of Rail

East Asiatic Company and the Indo-China Bank, French Indo-China.



BULLOCK CART IN INDIA

Road, almost 1,500 miles less than the mileage of our New England and Middle States, and only one and three-tenths miles of line to 10,000 inhabitants, so that we are more than 20 times as well supplied per capita as the residents of India. There were then under construction or sanctioned 2,992 miles of line.

Controlled by the State. These roads are largely owned or controlled by the state and, as in England, a government commission regulates rates.

The roads were built for the most part by private capital on 99-year concessions, the government receiving the option of purchasing them after 25 or 50 years.

All that Glisters. The total capital liability on all lines up to 1909 was $1,411,596,000, of which $1,382,547,404 is on existing mileage, an average of $44,907 per mile.

Ceylon had 562 miles of government-owned Rail Roads, the capital outlay on which averaged $41,100 per mile.

These figures about equal the average cost of the Rail Roads of our South Atlantic group of states. Considering that the roads are largely narrow gauge, which costs far less than the standard gauge, and recalling that their expenses for labor and materials are much lower than ours, their cost would either seem high or ours low.

Receipts, Expenditures, Etc. Receipts from all sources aggregate $150,000,000 per annum, to which passenger traffic contributes 34 per cent. Owing to low wages, the ratio of expenses to receipts is very low, being 50 per cent; yet despite this the government reported, in 1908, a loss of $7,569,936 for the year.

Delhi-Chicago. Delhi, the grain center and greatest shipping point in the colony, is, strange to say, substantially the same distance in the interior as Chicago. Four principal through lines run from Delhi, one reaching Calcutta, one Kurrachee and two Bombay.

The distance to seaport by these lines is from 888 to 954 miles, respectively; but the government requires on all lines an equal rate to the seaboard.

The rates are pooled and inflexible; the grain rates have been maintained for practically 15 years.

Rates. The average first-class rate per passenger per mile is 2.4 cents, or 20 per cent higher than that of the United States. Thirty-nine miles is the average trip.

The greatest average speed is made by the Premier train, which makes a scheduled run of 1,349 miles twice a week in 38½ hours, or 35 miles an hour. The hourly speed on the low-class trains is from 12 to 15 miles.

American Influence. Our average freight rate is 11 per cent less than the 85 cents per ton per hundred miles which India charges. This rate, low as compared with European rates, was brought about, according to the statement of a competent authority, by the competition of American Rail Roads.

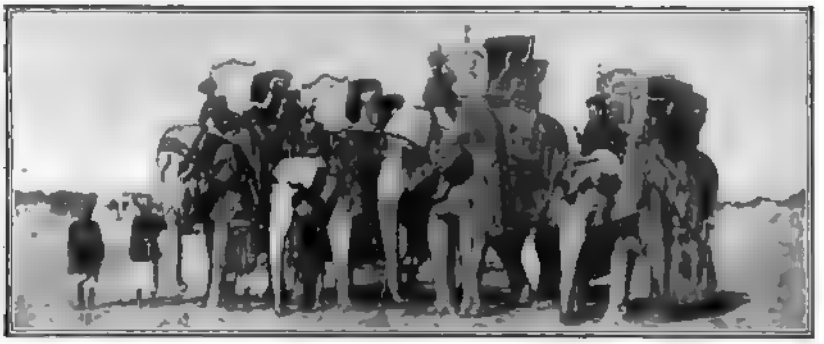
The wheat of Central India competes in the world's market with American wheat, and the rates on shipments to the coast had to be made low enough to place the Indian wheat on the basis of American.

Wheat Rates Less than Coal. But while India's grain rate is low, she eccentrically makes a coal rate 20 per cent higher than the grain rate, in order to recoup the loss on the latter. The coal rate in America is the lowest, but in India is so high that it exceeds our Lake Shore rate on traffic of whatever value and classification.

American roads carry 2,240 pounds of coal approximately 300 miles for a dollar; in India the rate would be $1.62, almost one and two-thirds as much as with us.

Indian Operation. Employes' wages on the Indian lines are ridiculously low, being only about one-tenth as much as ours. India has the advantage of cheaper coal at the mine, because of lower wages in mining it; there are long hauls similar to our own, and cheaper timber, ties and supplies. As a result the cost of operation in India is 50 per cent or less of gross receipts, while in the United States it is 67 per cent.

THRESHING BY DRAG, INDIA



ELEPHANTS OF A ROYAL RETINUE

Narrow and Diverse Gauges. The standard gauge of the Indian Rail Roads is five feet six inches; this prevails on 15,951 miles. On 12,863 miles the meter gauge obtains, three feet three and one-eighth inches, about two-thirds of the Rail Road gauge in the United States, but lines are also laid to gauges of two feet six inches and two feet. No effort to establish a uniform gauge is under way, but 80 per cent of the mileage sanctioned in 1909 is to be of five feet six inches gauge.

The benefits of a uniform gauge for all Rail Roads will be appreciated when we consider the experiences of those who have had occasion to make use of the Indian Rail Roads.

Vexatious Transfers. Sir Casper Purdon Clarke, who recently retired as Director of the Metropolitan Museum of Art, New York, relates that in transporting some goods from the interior of India to the sea, he shipped them on one line a distance of 500 miles, when, the gauge of the connecting line being different, he was forced to transfer the wares. They were then hauled 400 miles farther, but the gauge of the next connecting line also differed, so that another transshipment for the final 600 miles was necessary.

STRAITS SETTLEMENTS.

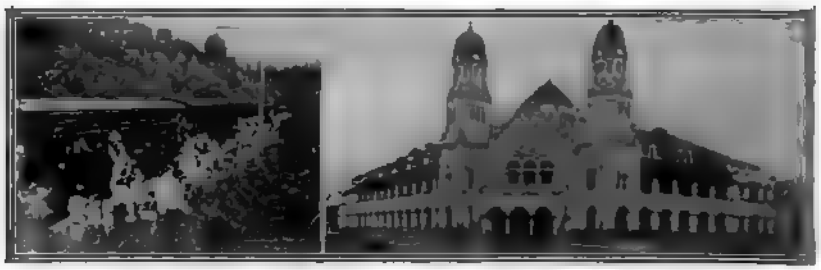
Singapore—Penang. A line nearly 500 miles long to connect Singapore with Penang is being completed. The Johore State Rail Way has a length of 121 miles through the dense jungle.

The cost of construction of the Singapore-Penang will be about $53,660 per mile. Eighty-pound rails are being laid and excellent rolling stock is to be used. A maximum grade of one-half of one per cent and maximum curvatures of three degrees have been strictly followed, permitting a speed of 40 miles an hour.

English Equipment.

The engines were built by an English firm and set up in the workshops of Johore; the cars are in course of completion at the central works in Kaula Pumpur. Stations are small but are to be enlarged when justified by traffic requirements.

Much of the brick used in bridges, culverts, etc., was made in yards at the side of the track, while quarries of laterite and granite have supplied materials for permanent way. The jungle furnished wood for the crossties and coaches.



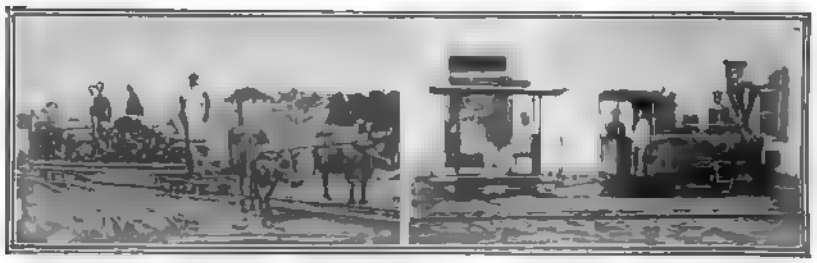
JAVA RAILWAY TRAIN. NETHERLANDS INDIA RAILWAY OFFICES, SEMARANG.

SIAM.

Two-thirds of the Rail Ways of Siam were constructed and are operated by the government. The privately owned lines were built many years ago by English and Dutch capital.

$31,992 a Mile Narrow Gauge.

The length in 1909 was slightly under 600 miles. The government-owned roads, all narrow gauge, represent a capital outlay of $31,992 a mile for 357 miles of line. Passenger fares average two cents a mile for first-class and one and a half cents for second-class travel.



HAULING ON RAILS BY BUFFALOES, DUTCH EAST INDIES. JAVA NARROW GAUGE.

THE DUTCH EAST INDIES.

Government Ownership.

With one exception, the Rail Roads in Java and the Dutch East Indies are government-owned, and the government has a working agreement with this private line permitting the acquisition of the road at any time. The population is about 30,000,000.

Of the 2,472 line miles in Netherlands-India, statistics on 1,510 miles are available. On these the capital outlay has been $85,810,000, or at the average of $56,828 per mile.

LABORERS CARRYING EARTH IN THE PHILIPPINES FOR A RAILWAY EMBANKMENT.

THE PHILIPPINES.

Dewey's Debut.

The Rail Road mileage of the Philippines on May 1, 1898—the day Dewey's fleet sailed into Manila Bay and annihilated Montojo's vessels—was 120. This was after 378 years of Spanish dominion, and 70 years after the introduction in other parts of the world of the Railed Road as an agent of progress and prosperity.

To-day, after a decade of American control, there are in operation or under construction almost 1,000 miles of steel roads, a 700 per cent increase.

Impetus Already Evident.

The 140 islands which make up the archipelago already are feeling a thrill, even though actual Rail Road operations are confined to the islands of Luzon—on which the capital, Manila, is situated Cebu, Panay and Negros. These four islands combine 10 per cent of the area of the archipelago and 20 per cent of the population.

The mileage is divided, roughly, as follows: Luzon, 700 miles; Cebu, 40, Panay and Negros, 100 each.

A Good Investment.

Acquired for $20,000,000 by cession from Spain following the war of 1898, the islands give promise of producing annually a sum far in excess of the purchase price and cost of pacification and govern-

ment

Exports to the United States, $3,830,415 in 1898, increased about 450 per cent, to $16,832,645 in 1910; and in the same 12-year period the imports from this country have increased 14,000 per cent, from $127,804 to $17,317,897.

A Proportion Reversed.

In the Philippines, as elsewhere in the thickly-settled Orient, two-thirds of Rail Way income is derived from passenger traffic, reversing the proportion which rules in the United States.

Our average population per square mile is 27; in the islands of Panay, Cebu and Negros the density of population is 160 to the square mile, which is exceeded only by the states of Connecticut, Massachusetts, New Jersey and Rhode Island. Cebu has a greater density than France, Germany, Japan or British India, and the population tributary to its Rail Ways has been estimated as 450 per square mile.

Bonds Are Guaranteed.

To encourage construction, the United States Government has guaranteed the bonds of the Philippine Rail Road Company, which holds concessions for 395 miles of line, of which 100 miles are in Panay, another 100 in Negros and 95 in Cebu. On these the narrow gauge of three feet six has been adopted, the lines otherwise being built and equipped in accordance with the best American practice.

Construction Cost Per Mile.

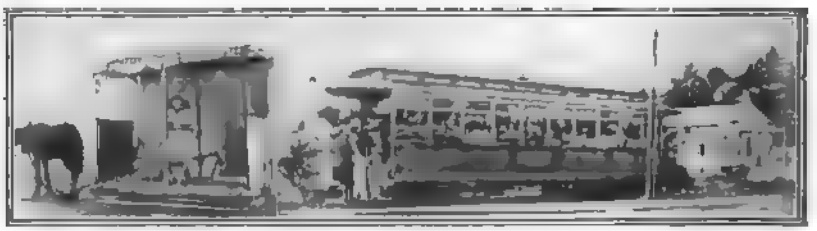
In 1908 the Philippine Commission reported that the construction cost of the Rail Road probably would be between $45,000 and $55,000 per mile.

The concessions of the Manila Rail Road Company on the Island of Luzon were made perpetual in 1906, in consideration of the abandonment of all claims for use, occupancy and alleged damage by the United States. The principal claim was for $1,515,000, gold.

Recent Growth.

In 1906 the company had in operation 200 miles of line. In 1907, 225 miles additional were well under construction and much of this is now in operation.

The rate of passenger traffic here is below that of the United States, being only one cent per mile, but the average cost of shipping a ton of freight a mile is a cent and a half—double ours.



RAPID TRANSIT IN MANILA BEFORE AND AFTER AMERICAN OCCUPATION.

CARTING WOOL, AUSTRALIA

AUSTRALIAN SHEEP YARD.

AUSTRALIA AND NEW ZEALAND.

The Brotherhood of Man.

Australia and New Zealand are ruled under a system differing decidedly from that of nearly every other country. The general laws show a strong trend toward socialism; so drastic is the enforcement of the eight-hour law, for instance, that one must shut up his shop at a given time, not even being allowed to work in one's own garden, except between specified hours, with the danger of a fine for working for one's self on Sunday. The effect of the expressions of such views in transportation legislation and operation is of deep interest.

First Lines.

Australia has more Rail Road mileage per capita than any other grand division of the globe. Victoria, the first to build, provided a line from the city to the port of Melbourne, two and one-half miles, in 1854. New Zealand's first Rail Road, from Christ Church to Littleton, began operation in 1863.

Private companies built most of the earlier lines, but the tendency to government control soon led to their purchase; roughly, 1878 may be given as completing the transition. Nearly all the later lines have been direct government works.

Lines Disconnected.

It is proposed to connect the lines of Western with those of Southern Australia, and thereby with all those of the mainland. Heretofore the Rail Roads of each colony have had no physical connection with the others, and jealousy and commercial rivalry between the colonies have been very bitter.

Figures of Interest.

With 2,972,862 square miles of territory, almost as large in extent as the United States, but with a population of only 4,000,000, Australia and Tasmania had, in June, 1908, 14,662 miles of government lines, and 1,400 miles privately owned, an average of 40.15 miles for each 10,000 population. New Zealand had about 3,000 miles to serve 105,000 square miles of territory and 900,000 persons.

The capital practically throughout Australasia averages $46,283 per mile. The large percentage of narrow gauge lines makes this cost not at all low.

Diverse Gauges. The gauge in Australia ranges from two feet to five feet three inches, fifty per cent, 7,176 miles, being three feet six inches.

Notwithstanding the praise which is bestowed by some upon the Australian system, the reports of many whose words should carry weight make us feel that the proverbial grain of salt may be worth taking with some of it.

Where Business Is Not Business. The managers of these roads, Americans or Britons, in some cases with no small measure of success to their credit at home, often have been placed in serious predicaments by the jumble of politics and local jealousies.

According to a well-known writer, the manager in many cases must be "so lacking in pride as to accept the dictation of uninformed legislators and agrarian agitators without protest."

A WOOL LADEN STEAMBOAT BRISBANE, AUSTRALIA.

Interstate Jealousies.

Keeping Asunder. To interstate jealousies, similar to those existing in the early days of New Jersey and New York Rail Road construction, is due the fact that the gauges differ, that physical connections are impossible, and traffic and rolling stock not interchangeable. The attendant inconveniences, cost of transshipment and delay, would not be tolerated to-day in the United States. Imagine tumbling out to change cars on reaching a state line; fancy all freight being rehandled at a boundary; consider also that many shipments pass through several states in order to complete an intra-state journey. From Memphis, Tenn., to Chattanooga, Tenn., the usual route is from Tennessee across Mississippi, Alabama and Georgia, and back into Tennessee. The result would be chaos, and transportation costs would run up to commercially impossible sums.

Interior Development Halted.

Australia reverses us, as manufactured products of the interior cannot compete with products of seacoast cities; as a consequence, Australia has few inland cities, only two of which approach 40,000 in population.

Figs or Thistles?

The high rates—freight costing an average of 2.08 cents per ton per mile, two and two-thirds our own average rate—and the poor service of these roads, are, by "conservatives," alleged to exist as results of government ownership. Similar conditions in Germany, Italy and Russia seem to confirm the reasoning that sees in these examples cause and effect.

AUCKLAND, NEW ZEALAND. BROKEN RIVER GORGE, N. Z.

It is maintained not only that business suffers, but that the general treasury is depleted more and more every year. The public debt is considerably above all the interest-bearing debt of the United States, or $1,128,632,767 in all, and this is borne by a population less than 5 per cent of ours. The per capita indebtedness is $282, against $11.83 in the United States. In other words, one Australian carries upon his back as heavy a share of the government debt as twenty-four men in the United States.

Crushing Interest.

Revenue is constantly deficient. A population of four millions pays $44,000,000 in interest each year, or $11 per capita, against 33 cents in the United States. Three Australians, therefore, bear the tax burden of a hundred Americans. Or, in other words, if we were as heavily in debt per capita as Australia, our national debt would be nearly $27,160,000,000, and our interest account alone $792,000,000, considerably more than the entire receipts of the United States government from all sources.

One critic says: "A study of the economic conditions impresses me with the fact that no greater punishment could be given socialistic agitators than to send them to New Zealand."

A SHIP OF THE DESERT. TUNIS. A NEW SHIP OF THE DESERT.

AFRICA.

The White Man's Aid in Carrying the Black Man's Burden.

Forgotten Facts. It may astonish you to know that Africa has 113,000,000 inhabitants. You may also be surprised to know that it is almost double either the North or South American continent in size, having 12,000,000 square miles of territory, thus containing one-fourth of the earth's land area.

Yet there are only 20,000 miles of Rail Road in operation, the most important lines being in the north and south, where the major part of the mileage is also found. The standard is a narrow gauge of three feet six inches. It is interesting to note what has been the influence on progress and prosperity of improved transportation, and what are conditions where it is lacking in Africa.

Political Divisions. The continent embraces almost twenty countries or colonies, and a number of districts under the influence of European nations. Broadly, it is subdivided into North, Central, South, West and East Africa.

The modern history of the interior of Africa is substantially but 50 years old, for it was not until 1858 that Sir Richard Burton and Captain Speke penetrated it and discovered Lake Tanganyika; two years later Speke and Grant found the source of the Nile and Lake Victoria Nyanza, and about the same time Sir Samuel Baker, then in the employ of the Egyptian government, discovered Albert Nyanza.

The Pathfinders of Africa. The intrepid Dr. Livingstone had preceded these travelers into the wilds of Africa, but it was 1866 before he entered the Congo region and discovered Lake Moero and Bangweolo. In 1871 the courageous doctor, so long lost to the world, was found by Henry M. Stanley, who headed an expedition sent out by the New York Herald.

All of us know the story of the great gold fields of South Africa, which produce a little more than one-third of the entire annual output of gold of the world.

The Earth's Riches.

We are all of us likewise familiar with its wonderful diamond mines, which produce by far the largest part of the world's supply of these precious stones.

But few of us are familiar with all the efforts for development that are being made, so that it may cater to the more substantial wants and become a customer of the products of civilization. The story of modern progress in Africa, as elsewhere, is substantially the story of better roads and Railed Roads.

Cape to Cairo.

The Dream of Cecil Rhodes.

A counterpart of the Western Hemisphere's Pan-American Rail Road is the Cape to Cairo Transcontinental, the so-called dream Rail Road of Cecil Rhodes, now almost on the threshold of becoming a fact. It will extend from the Cape of Good Hope, to Cairo, Egypt, an air-line distance of about 4,400 miles, running through British territory for much of the distance.

The southern section of the road was opened in 1905, from Cape Town through Bulowayo to the Zambesi. By 1907 the road had been extended to Broken Hill in Rhodesia, 374 miles beyond Victoria Falls, and 2,018 miles from Cape Town. The fare from Cape Town to Broken Hill is $98, or 4.9 cents a mile.

On and On and On.

In March, 1909, work was begun on a 400-mile extension, which will carry the road across the Congo line at Lake Tanganyika and 300 miles beyond, making the southern section 2,500 miles long, and bringing its head to the Blue Nile, 2,340 miles south of Cairo, where a connection can be made with another, though short link.

Passenger tariffs are 6 and 4 cents for first and second-class, respectively, for the first mile, with reductions for succeeding miles, so that for considerable distances first-class fare is less than 4½ cents a mile. Freight rates are about in proportion.

Houses of Parliament Pietermaritzberg. Government Building, Pretoria

ANCIENT AND MODERN TRANSPORTATION, EGYPT.

NORTH AFRICA.

Egypt.

Egypt has about 3,500 miles of Rail Way to serve a population of 10,000,000, and contains 400,000 square miles of territory. The capital averages $74,867 per mile, through level country without obstruction.

It is the land of pyramids and obelisks, where the Sphinx looks on as civilization pushes its gridiron over the burning desert sands.

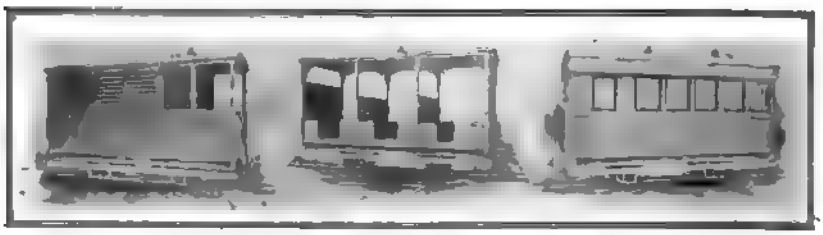
Old Glories Renewed.

The history of Egypt is 7,000 years long, its middle period being 2,000 years B.C. But the next seventy years will probably see greater commercial advances than were made in all the years following the loss of its early position as the granary of the world.

Since 1882, a British army of occupation has been quartered in Egypt, though the country is governed by its own Khedive, under suzerainty of the Ottoman Empire

The Rail's Status.

The principal Rail Ways are those from Cairo to Alexandria, 129 miles, and from Cairo, along the banks of the Nile, to Assuan, 583 miles. Between Assuan and Wady Halfa, there is a gap of 512 miles without Rail Way connection, traffic between these two points being carried on by steamer. From Wady Halfa, at the second cataract of the Nile, another important line runs to Khartoum, where the famous General Gordon was killed in 1885. This is a military Rail Road 575 miles long, over which a "train de luxe" is operated twice a week.



EGYPTIAN CARS.

Service and Cost.

Rail Road fares in Egypt run from 4 to 6 cents a mile for first-class travel. The Rail Roads in 1908 transported 25,851,000 passengers, 23,346,000 of whom traveled third-class. Freight brings in 50.78 per cent of the total revenue. The receipts per freight train mile average $2.32½, and per passenger train mile, $.621.

Employes number 23,051. It is surprising to find that 22,094, or 96 per cent of them, reported sick for an average of 8.7 days, during the year 1908.

TWO KINDS OF POWER.

THE MEDITERRANEAN REGION.

Algeria and Tunis have an aggregate of 3,770 miles of line, of which 106 miles are electrically operated. Tripoli has about 100 miles of line; Morocco has none.

Along the Coast.

Much of the mileage of Tunis and Algeria parallels the Mediterranean coast or connects the coast towns with the 825 miles of Rail Road which runs between the coast cities of Tunis and Oran, by way of Algiers. Much of this line is about 20 miles from the coast, but a detour at one point puts it 65 miles from the Mediterranean. One line penetrates the interior of Algeria for a distance of 475 miles from Oran, almost paralleling the Morocco boundary at a distance of 30 to 60 miles.

The mileage embraces nine systems, the French company, Paris, Lyon et Mediterranee owning about 315 miles. Of the eight others, seven are run by local corporations. The ninth system is the State Railways of Algeria.

Parlor and Sleeping Cars.

On many of the lines, parlor and sleeping cars, dining cars—known as wagon restaurants—and buffet cars are operated on some of the trains.

First, second and third-class carriages are operated, the first-class fares ranging from 2 1/3 to 3 1/2 cents per mile, second-class 1 3/5 to 2 3/5 cents, and third-class, 1 1/4 to 2 cents.

THE SAHARA.

Ring Out the Old.

When the military Rail Road was built across the African desert, it was naturally availed of in the shipment of rugs and precious stones. Goods of various other kinds, cheaper than these, which could not stand the cost of camel transportation, about twenty times as expensive, also began to be shipped from this waste.

The belief had existed that the desert could produce nothing, but the commercial spirit of the people of this region was awakened when an opportunity to do business arose Dry farming may succeed there as it has in the United States. In fact, there are sections of the Sahara that are far from arid.

PASS AND TUNNEL, ALGERIA

GOVERNMENT PALACE, ALGERIA.

THE WEST COAST.

Unmarked Future.

Until recently little interest had been taken in the development of the countries on the west coast of Africa. The future and civilizing of the colonies here depends on the opening of the interior by roads and Rail Ways, which, it is predicted, will before long assume dimensions of importance.

Gold Coast.

The construction of the 168 miles of Gold Coast Rail Ways has required an average outlay of $51,613 capital per mile.

Husbandry Benefits.

The first sod of the Accra-Akwapim Rail Way on the Gold Coast was cut on January 7, 1909; the greatest benefit will accrue to the agriculture of the country, especially the cocoa industry. An economic revolution in transportation will undoubtedly be achieved by the extension of the line, greatly increasing the shipments of the already important output.

The provisional terminus of the section is not farther inland than Mangoese, 40 miles from Accra, but considerable extensions are in view.

Nigeria.

Into the Interior. In Southern Nigeria, just above Kamerun, a narrow gauge Rail Road line has been built from Iddo Island to Oshogbo, 185 miles, and is being extended to the Niger at Jebba, where it will run nearly to Zungern, connecting there with another line from even farther north.

The latter Rail Way is under construction from the highest point to which the Niger is navigable during the whole year, the cost of construction being $44,000 per mile.

Portuguese West Africa.

The Benguela Rail Way is under construction from Lobito in Angola to Katanga in the southeastern part of Congo Free State, and eventually will be extended to connect with the Cape-Cairo and Rhodesian systems.

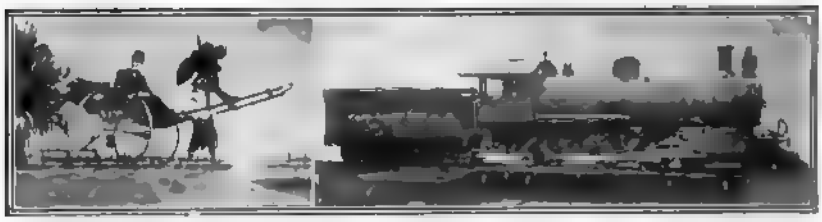
A Human Log Team.

SOUTH AFRICA.

A Vast Colony. South Africa, largely a tableland, three to six thousand feet above sea level, is more than two-thirds the size of the United States.

It was known to the ancients, for Herodotus, the "Father of History," speaks of the rounding of the Cape of Good Hope by an Egyptian fleet in 610 B. C. Bartholomew Diaz rounded the Cape in 1486, and named it "Tormentoso," or stormy.

John Bull's Policy. In 1651 the Dutch settled the Cape country, but it was seized by the British in 1795. Although restored to the Dutch in 1802, the following year the British seized it again, and, making a cash settlement with the Netherlands, retained it.



THE HUMAN AND THE STEAM LIVERY, SOUTH AFRICA.

The political divisions of South Africa are: Cape Colony, Basutoland, Natal, Bechuanaland, Orange River Colony, Transvaal, Swaziland, and Rhodesia. There are about 7,500 miles of modern steel highways in all. The fares average 4½ cents a mile, being as high as six cents for first-class travel; the second-class is used only by the natives.

Cape Colony.

3,000 Miles.

There were 2,987 miles of Rail Road in Cape Colony on January 1, 1908, and other mileage was under construction, largely government enterprises. Rail Road fares are the same as enumerated under the Cape-to-Cairo section. Bedding must be hired. This costs one dollar a set on Cape Colony roads, and two dollars when used on both the government lines and the Central South African road.

RAILWAY STATION, CAPE TOWN. [illegible] STREET, CAPETOWN.

Natal.

The Rail Roads of Natal, 900 miles of narrow gauge lines, were built by the government at a cost of $74,944 per mile, almost thirty per cent above the net capitalization of our standard gauge lines. Standard gauge may usually be estimated to cost well on to twice as much. In the United States, half a mile of side-track is included, while in Africa there is little terminal or side-track. The roads earn gross about $9,000 per mile, and net about $2,900, the ratio of expenses to earnings being about 68 per cent.

A HUMAN-PUSHED GARRY, MOMBASSA. THIRD CLASS TRAVELING, UGANDA RAILWAY

Construction Difficulties.

The construction of this system was unusually difficult, the land rising rapidly from the seashore to an altitude of 5,000 feet. For the same reason, the cost of running trains is higher than our average. Were the pay roll as costly as with us, the amounts required to pay interest and secure a sinking fund would have to be raised by taxation, or there would have to be a marked increase in rates, which are already high.

Central South Africa.

South African Federation.

In Transvaal, Swaziland, and the Orange River Colony, the Central South African Rail Ways are operated by the government, their length being 1,788 miles. This does not include small private lines, mineral roads and similar enterprises.

This is the land of the Boers, and is remembered as the scene of stubborn resistance to British control. The country is given over to agriculture and mining, and is one of the richest and most promising sections of the continent.

Statistics.

The population of Transvaal and Swaziland is 1,400,000, of which only 300,000 are white; their area, 111,196 square miles, is 40 per cent the extent of Texas.

Orange River Colony is about the size of Georgia, having 50,392 square miles, and the population numbers 400,000, of whom 150,000 are white.

Bechuanaland.

Bechuanaland is a British native protectorate, its area of 438,000 square miles being almost twice the size of Texas, and has a scattered population of 200,000, of whom less than 10,000 are whites. The only Rail Way facility is the Cape-to-Cairo road, which runs through a six-to-ten-mile strip ceded to the company.

Rhodesia.

Rhodesia, which has a population of 700,000, of whom probably 17,000 are whites, has an area of 750,000 square miles, being, therefore, about one-fourth the size of the United States. There were 1,450 miles of Rail Road in operation in Rhodesia in 1907, and this has been slightly increased since.

One-Fourth Our Speed.

There is an 84-mile road from Salisbury, the capital, north to the gold mines, part of a line which taps the Cape-to-Cairo at Buluwayo, and, passing through Salisbury, traverses Portuguese East Africa to the port of Beira. The average speed of first-class trains is 14 miles an hour, and the passenger tariff is 6 cents a mile.

Portuguese East Africa.

The foregoing line, and one which crosses the narrow strip of land between Lorenzo Marquez on Delagoa Bay and the Transvaal —the latter 394 miles long, terminating at Johannesburg and passing through Pretoria—furnish Portuguese East Africa with its only transportation by rail, the entire mileage of the colony being 261 miles. Five cents per mile is the passenger fare on the road to Johannesburg.

German East Africa.

German East Africa.

German East Africa has but 150 miles of Rail Road, and several private lines and tramways. The territory has a population of 8,000,000, and an area of 384,180 square miles. Gold is found in many places, and the future of this section is said to hold out wonderful promise.

FREIGHTING ON HUMAN HEADS ON SAFARI

British East Africa.

The Uganda Rail Way.

In British East Africa may be found the famous Uganda Rail Way, from Mombassa, on the coast, to Port Florence, on the Victoria Nyanza, a distance of 584 miles. A steamer line operating twin-screw 600-ton steamers around the lake connects with the road at Port Florence. The line goes through a mountainous territory, and gradually rises to 8,300 feet.

The cost of construction of this narrow gauge line averaged $45,657 per mile. Fares for passengers average 6 cents a mile.

As an example of freight rates, it is interesting to note that it cost Dr. L. L. Seaman substantially $250 to bring four cases of trophies from Uganda to Mombassa. He estimated that the total weight did not exceed 1,000 pounds.

The Uganda Rail Road is said to have low rates on grain and other products to encourage traffic, but they publicly declare that they get as high rates as they can from those who can afford it.

"On Safari." It is very interesting to note the cost of primitive travel and transportation in comparison with modern methods. For "on safari," as travel in this portion of Africa is called, approximately 35 porters are necessary to carry the outfit and supplies necessary for each European. As each porter will carry only 60 pounds, it will be seen that the 35 men can transport only a ton among them.

When an individual package exceeds 60 pounds in weight, the sturdy porters decline to carry it, calling it a "woman's load."

43 Cents a Ton a Mile. These porters receive from three to five dollars per month; their day's journey is reckoned at 10½ miles. As a matter of fact, by the payment of extra wages, an "express" speed to 14½ miles daily may be made. Ordinarily, however, the cost of transportation is 43 cents a mile for a ton of goods, plus the cost of food for the whole outfit of thirty-five, should game not be available. While this makes transportation high, $4.52 would not be considered a large sum to be divided among a gang of 35 men for a full day's work.

JOHANNESBURG, TRANSVAAL. BLOEMFONTEIN, ORANGE FREE STATE.

The Congo Free State.

An Empire in a Wilderness. The Congo Free State, a protectorate of Belgium, touches the Atlantic coast and extends west to the Nile. It has an area of 1,500,000 square miles, half that of the United States. Its population slightly exceeds 20,000,000.

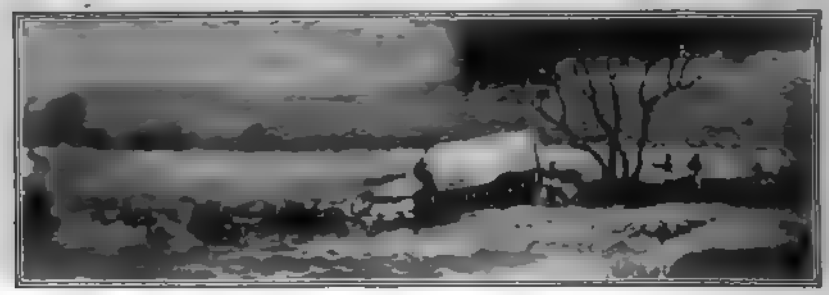
A Father of Waters.

The Congo river pours into the Atlantic ocean 15,000,000 gallons of water every second, enough in twenty seconds to fill a day's water requirements of New York City. The river is 2,100 miles long from where it first assumes the name Congo, but its source is 1,300 miles beyond, a total of 3,400 miles. At its mouth it is twenty miles wide.

It is a far cry from the early litter and saddle ox of this region and freight carriage on the heads of human beings to its Rail Way lines, crude as they are compared with those of the western nations.

Cruelties?

While the world's attention has been drawn to the barbarities which have been perpetrated in the Congo region, these are not nearly so horrible as those which have been stamped out since the arrival of the white man.



FORDING AN AFRICAN STREAM WHILE TREKKING

The constant wars among the native tribes have been largely eliminated since the introduction of European suzerainty. The slave trade with other parts of the world, and the enslavement of prisoners of war, are, to a great extent, things of the past. This has come about by the spread of civilization, incident to the introduction of mechanical transportation, and is another illustration of transportation as an agent of progress.

Trade Deterrents Abolished.

The first Rail Road in the Congo Free State was commenced in 1889, the last spike being driven in 1898, constructed at a cost of about $46,000 for each of its 260 miles. It was built from Matadi, about 30 miles from the mouth of the river, to Stanley Pool, and bears the name "Cataracts Rail Way," because it connects the navigable part of the upper river with the lower, by detouring the 32 great cataracts which extend for 80 miles of the river.

Trains are run every other day on the road, and the first-class fare is 40 cents a mile. This is said to be the most expensive as well as the most profitable Rail Road in the world.

The Mayumbe road, from Boma, on the river, to Lukula, 54 miles north, was finished in 1901, and other Rail Roads are now under construction or have been surveyed.

How Large Cost Arises.

We have elsewhere shown that in Africa, as a rule, only merchandise of great value can stand transportation. One of Cook's most recent guide books substantiates this in detailing the tour to make connection between the Uganda Rail Road and Khartoum.

In the Congo, Belgians are building two highways from the interior as feeders for the Rail Roads and river lines. Motors and traction engines are to be operated on them.

It has not been possible to secure all the average freight rates on the African Rail Ways, few statistics having been compiled or being available. It is safe to assert, however, that their freight rate is greater than the average of America in substantially the same proportion that the passenger rates of the Dark Continent exceed the average for American roads.

The Future.

It would seem apparent to even the most casual reader that Africa, which extends from a parallel of latitude on the north substantially that of Washington, D. C., and reaches to the parallel of Buenos Aires, thus embracing both tropic and temperate zones, with its 113,000,000 of people, has potentialities and will have an influence in its consumption of the world's wares, giving it a prominent place in the greater story of the progress and prosperity of the future.

HEAD CARRIAGE, AFRICA. AFRICANS AND THEIR HUTS.

INCREASING COST AND CAPITALIZATION OF FOREIGN RAIL ROADS.

The cost, capitalization and growth of capitalization of foreign Rail Roads are interesting when compared with those of American roads.

In John Bull's Domain.

In England, which is generally thickly settled, the roads have been built very substantially. One of the first cost the tidy sum of more than $100,000 a mile, yet it was estimated to be only "strong enough to sustain a six-ton locomotive."

According to official statistics, the cost of construction and capitalization in Great Britain has risen steadily. This is not unnatural. The cost of the various items entering into construction has advanced, and besides, the road of to-day is built with a greater complexity of parts and more substantially, not alone for the greater safety of passengers but as well in order to support the heavier rolling stock and loads and permit faster trains.

$162,493 to $272,523.

In 1860 the average cost per mile was $162,493; in 1870 it was $166,090; in 1880, $197,786; in 1890, $217,739; in 1900, $262,051, and in 1909 it had increased to $272,523. Taking the original cost of Rail Roads in England alone at $100,000 per mile, as compared with the present cost of $315,000, we find a vast additional expenditure to bring the old lines up to date and construct modern ones. This is not merely for new lines, but is the average increase in cost and capitalization of all lines—and made with the approval of the English Rail Way commission, the Board of Trade.

Although there has been practically no opportunity for what in America we call high finance, we see how large the actual investment has become.

All From Capital.

One reason for the high capitalization of the English Rail Ways may lie in the fact that improvements and betterments are charged to capital account, while the net receipts are distributed among the stockholders in the form of dividends, instead of a part being diverted into the road to pay for the improvements and additions, as is almost the general custom in the United States.

Germany.

The cost of German Rail Roads is less than that of the British Isles. For this there are several reasons—labor is cheaper, physical difficulties are fewer, and the cost of right of way is probably less. Then, again, the roads were not quite so well and substantially built.

Yet the average cost and capitalization per mile of line in 1870 was $84,695; in 1880, $101,448; in 1900, $97,723. In 1909 it was $108,872, about 75 per cent more than the average net capital in America.

Costly Unification.

Between 1870 and 1880 the outlay for the unification of the German roads, under Bismarck, resulted in an increase of over $16,000 a mile; yet only partial benefits have been gained from this, as we show in the chapter devoted to Germany.

Belgium.

An explanation of the high cost of the Belgian Rail Roads, $187,950, may be partly found in the density of the population, over 600 to the square mile, and the consequent high cost of rights of way, together with state extravagance in acquiring them.

In La Belle France.

In France, also, the construction cost is much greater than in the United States. In 1896, according to official statistics, the average cost of construction was $133,136 per mile; in 1900, $135,138,

and $137,276 a mile today, or two and a fourth times the average for American roads.

Banzai.

All the Rail Roads of Japan are comparatively of recent date. There was not a mile in the empire in 1871; as late as 1880 there were only 121 miles; now there are almost 5,000 miles.

For its plan to nationalize the Rail Roads of the islands, the government had a number of roads under consideration, and for these an average of $74,393 was fixed as the purchase price. It was at that price, approximately, that they were bought.

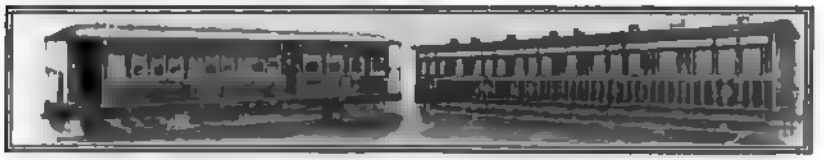
The trifling cost of labor in Japan, light rolling stock and meager equipment, as compared with ours, will throw still further light on the valuation of the Rail Roads in the empire.

Labor Costs 8 Cents a Day.

In India the cost is about $43,000 a mile. Nearly fifty per cent of the roads are narrow gauge, which naturally is cheaper to construct. The apparently low cost is further explained by the consideration that in India unskilled labor costs from 4 to 8 cents a day—even less than in Japan. It is safe to say that if the same equipment and the same gauge and quality of line were built in India the cost would equal, if not exceed, that of American lines, despite the difference in labor cost.

Australia.

In the Australian colonies the cost varies from $34,739 in Queensland to $62,672 in New South Wales. In these instances the occasion for the figures may be found in that there are many miles of narrow gauge, and that the country has large, level stretches. In Victoria, for instance, the greater part of the construction is of 30-inch gauge, scarcely what we would consider a good tramway gauge, although the remainder of the system is of 63-inch construction.



NEW ZEALAND PASSENGER COACH. AUSTRALIAN FIRST-CLASS CAR.

New Zealand.

New Zealand roads are constructed of the narrow 42-inch gauge, and more than half of the mileage is laid with a 53-pound rail or less, against the 80 to 85-pound rail used in America. In 1900 the cost of these roads was $38,755 per mile; in 1903, $41,083, and in 1906, $45,826, an almost 20 per cent increase in six years.

Elsewhere.

The average capital cost per mile in Austro-Hungary is $95,600; Italy, $110,104; Norway, $38,225; Denmark, $26,281; Holland, $86,211; Switzerland, $107,750; Canada, $66,750; Mexico, $57,847; Argentina, $51,000. The cost of the Rail Roads is shown in detail in the individual articles dealing with these countries. Most of these have increased in

approximately the same degree as those about which we give the details.

The total capitalization of all the Rail Roads of the world, our own included, was estimated in 1909 at $50,000,000,000, an average of $84,000 per line mile.

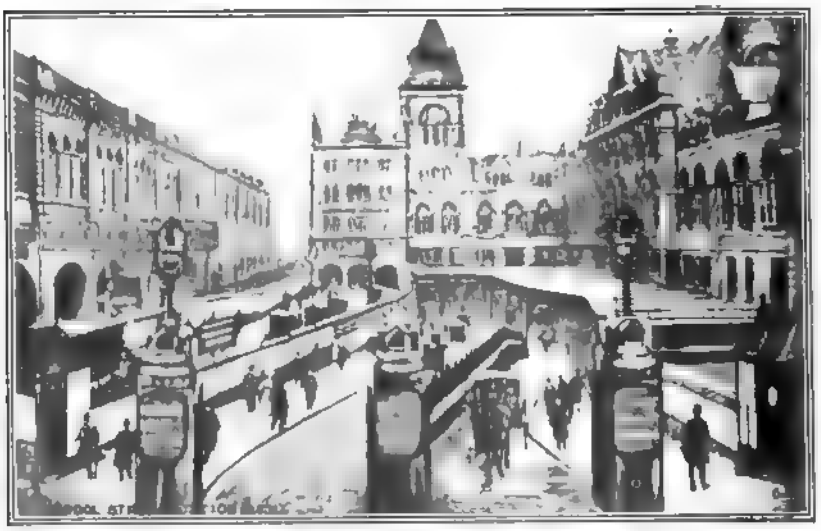
Excluding the Rail Roads of the United States, the capitalization of the Rail Roads of the world is nearly double that of the Rail Road of the United States, or to be exact, 90 per cent greater.

America to the Front.

From the foregoing it would seem that the capitalization of American Rail Roads, which averages only $58,050 net per line mile—although we have the best equipment in the world, and more of it—is far below that of any other country that even pretends to have first-class roads, even where the main item of cost—labor—is but a fraction of ours.

If our Rail Roads have cost more than they should, other nations seem to have been no more successful in construction at a cost cheaper than ours, notwithstanding cheaper labor and less equipment. May we not congratulate ourselves upon what we have accomplished, when viewed in the light of what has been accomplished by the other nations of the world?

It is evident that other nations have had to increase their capitalization to rebuild and strengthen their lines up to date, just as we have, and that their average increase in capitalization has been even greater than ours. Nevertheless, our roads can and do haul larger loads than those of any other country and at lower rates.



ENTRANCE TO LIVERPOOL STATION, GREAT WESTERN RY

SUMMARY AND CONCLUSIONS.

Foreign Passenger Rates.

A gentleman who, in his capacity as representative of a large agency, has for years arranged tours for individuals and parties through Europe and other foreign countries, says that with all the extras, fees, tips, etc., and considering the small amount of baggage allowed free by foreign Rail Roads, a person traveling with a reasonable amount of luggage cannot hope to travel on European roads for "an average of less than six cents a mile first-class, four cents second-class, and three cents third-class, all extras included."

Where Uncle Sam Leads.

Our Rail Roads charge for the best or absolutely first-class travel, including sleeper or parlor car, an average of two-and-a-half cents a mile.

As we have noted elsewhere, the average weight hauled in the United States, including the passenger, his baggage, and the equipment carried for him, is five tons—a weight far exceeding that hauled abroad for each passenger, as their rolling stock is much lighter than ours, and the seating capacity is used in a larger proportion.

Shifting the Cost Basis.

Assuming that this gentleman is correct, if the European cost of passenger travel ruled in the United States: figuring on this second-class cost, there would be an outlay of an additional 96 cents for every $1.00 now spent.

We find that passenger charges, instead of being $563,609,342, would be $1,094,684,310. So our system means a saving of $531,074,-968 in a single year, or nearly as much as we pay for that part of our Rail Way service.

Freight-Saving $1,526,629,356.

For each passenger carried on our Rail Roads, eight tons of freight are carried for the farmer, miner, lumberman or manufacturer, at a cost of $1.00, against $1.91 for an equal amount of freight service in Europe.

In other words, our freight bill would be $3,204,245,034 annually under the average European tariffs, instead of $1,677,614,678; for freight alone the bill would be $1,082,000,000 more than the total receipts; the American system represents a saving of $1,526,629,356 a year; almost the total value of all the goods we export and sell to the rest of the world annually.

Helping the Nation Along.

The total saving on both the passenger and freight service as rendered by our Rail Roads in a single year, compared with those of Europe, is $2,057,-704,324, a sum sufficient to pay off the entire debt of the United States and enough in addition to pay all the nation's expenses for practically a year and a half.

Sight must not be lost of the fact, however, that the average passenger and freight hauls in all European countries, with the one exception of Russia, are considerably below our average hauls, the

greater length of the haul tending to decrease our rates somewhat. This would make some difference in the aggregate.

Opinions of Distinguished Foreigners.

Mr. W. R. Lawson, a British expert, who investigated our Rail Roads in 1903, wrote as follows: "The science of transportation is going to be the special contribution of the American people to political economy."

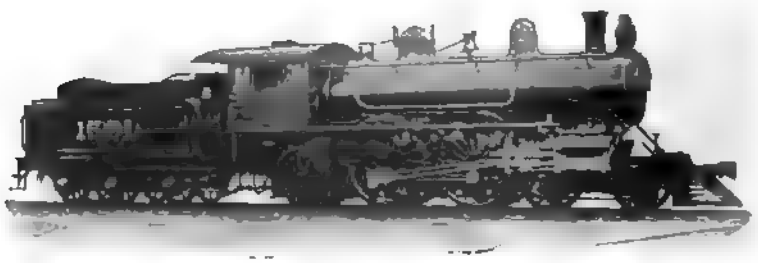
Mr. Nevill Priestley, Under-Secretary to the government of India, Rail Way department, in 1904 investigated our Iron Highways. He included the following in his report: "American Rail Way men are quick to see a new idea; they are quicker still to try it. That their methods are not always perfect is what might have been expected, but they have managed to do what no other country in the world has done, and that is to carry their goods traffic profitably at extraordinarily low rates, notwithstanding the fact that they pay more for their labor than those of any other country. It is in the study of how they do this that much benefit can be derived by other countries."

Mr. Leroy Beaulieu, a distinguished French economist, in 1905 wrote: "If one were in search of model Rail Way methods, it would be wise to turn to those practised under the free American system—not to those illustrated by a system operated under the debilitated control of the state."

In an official German report on American Steam Roads is to be found: "If Germany, like the rest of the civilized nations of the old world, has grown stronger and gained a new life through the construction of Rail Roads, the United States, at least what we include in this designation, has been actually created, properly speaking, by the building of Rail Ways."

What Our Rates Mean.

Our transportation rates have been among the great factors that have made our nation the richest in the world, and aided our progress and prosperity. They have enabled the farmer of the West and interior states, through competition of carriers, to market his crops in the industrial centers of Europe at a profit, while the farmer of Russia, Roumania, Servia and Austria, close at hand, barely ekes out an existence.



ENGINE ON THE NASHVILLE, CHATTANOOGA & ST. L. A MODERN AMERICAN STEAM HORSE.

WORCESTER TO ALBANY RAILWAY, FIRST COMPARTMENT CAR.

SECTION XXXI.

TRAVELING HOTELS ON RAIL ROADS HERE AND ABROAD.

The Pullman Car and Its Contributions to Comfort.

Progress and prosperity, in their actual and applied sense, mean added comforts, conveniences, and facilities.

A Standard of Comfort.

The advertisement for one of the early stage coaches between New York and Boston, set forth that the passengers reaching Hartford at 3 a. m. would be allowed to "sleep in their seats" until 5 a. m. This was considered a very great convenience.

Doubtless the traveler who had been accustomed to getting his sleep in a stage coach, or had been used to sleeping upright in a Rail Way coach, thought the early sleeping cars most luxurious, although they bore very remote relationship to our present standard of Rail Way sleeping accommodations. These early sleeping cars had three tiers of so-called bunks, or berths. Judging from descriptions of them, they resembled coffins on shelves rather than sleeping quarters.

Simplicity.

Sheets and blankets were superfluous luxuries. The bedding consisted only of mattresses and pillows, which, when not in use, were thrown into a pile in a corner of the car.

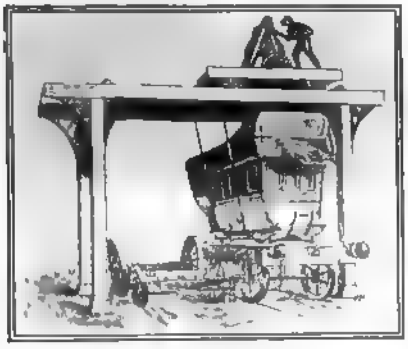
The first sleeping cars were run upon the Cumberland Valley Rail Road in Pennsylvania in 1836; other lines gradually adopted them

It was after a night's experience in a car of the style then in use, that George M. Pullman was induced, in 1858, to try his hand upon their improvement. The first sleeping cars designed by him were operated on the Chicago, Alton & Galena and Chicago Union, in 1859. They had many shortcomings, and were almost complete failures.

The "Pioneer."

The "Pioneer," completed for the Alton in 1864, was Pullman's first successful car, which was two and a half feet higher and one foot wider than any car then in use. It cost $18,000, and was considered a wonder of luxury, although in convenience and attractiveness it falls far short of those of to-day. The "Pioneer" was soon followed by the day parlor car. The dining car, the first of which, the "Delmonico," was used on the Alton, also came about this time

The "Pioneer" was used as a funeral car for Abraham Lincoln. That the car might perform its august service, the rebuilding of bridges, the cutting away of platforms, and the moving of stations from the lines was necessary. Lincoln's son, Robert T. Lincoln, is to-day president of the Pullman company.



LIFTING A COACH BODY FROM ROAD TO RAIL, ENGLAND

INTERIOR OF A MODERN SLEEPING COACH.

The Present Standard.

Sweeping Changes.

Pullman's initiative and the encouragement he received set the present standard for passenger equipment. In the early days one could not stand upright in a passenger car.

There are now in operation by the Pullman company approximately 5,000 sleeping and dining cars, traveling over 198,610 separate miles of line. The total number of miles run in the course of a year is approximately 407,000,000, sufficient to go 16,280 times around the earth.

An Agent of Prosperity.

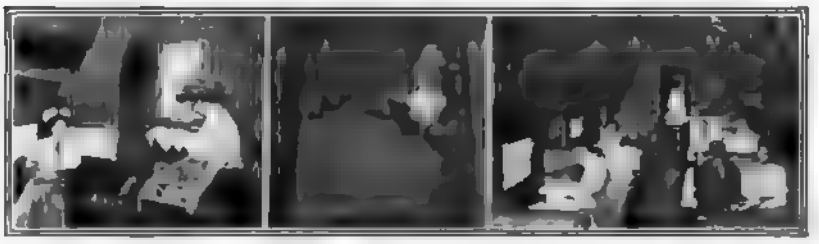
The company employs over 20,000 men, and has an annual pay roll of nearly $14,000,000. It gives an annual premium of a month's wages to each conductor and porter who has a perfect record for service during the year, these bonuses amounting to several hundred thousand dollars.

Pullman Shops. The Pullman shops are probably the finest car shops in the world, and are capable of turning out each week six sleeping, twenty passenger, and 500 freight cars. They consume annually about 150,000 tons of iron and about 125,000,000 feet of lumber.

All the Comforts of Home. It is no hardship to travel upon a modern American Pullman train, which has every convenience of the most luxurious home or hotel, sleeping and compartment cars, parlor or living rooms, library, smoking and lounging rooms, cafe, restaurant, barber shop, baggage compartment, bath room, stock exchange reports, postbox and the observation car with its semi-closed porch or portico.

Telegrams. Telegrams can be sent from some trains even while they are in motion, and stenographer, maid and valet service may be had when desired. With the exception, naturally, of the dining room, barber shop, bath, and telegraphic service, these conveniences are free on payment of the Pullman tariff.

A modern Pullman car costs from $18,000 to $25,000, and for its size is exceeded in cost, expense or luxury by few, if any, millionaire palaces; yet it may be used as a sleeper for a whole night or a parlor car utilized for practically a whole day for approximately $1.50 to $2.00.



THE LAVATORY IN A BERTH. A TOURIST CAR

The Laundry. The clean linen used by the Pullman company amounts to 110,000,000 pieces per annum. And that you may feel more comfortable in your Pullman car in the future, we might tell you that the maintenance of the sanitary conditions of all Pullman cars is a matter of constant vigilance to every officer and employe of the company.

In all Pullman cars built within the last five years carvings have been replaced by inlaid work, angles and corners have been rounded, ledges and dirt-catching places eliminated, walls of toilets covered with enameled surfaces, wash rooms given open plumbing as in the most modern houses, china basins substituted in place of nickel, and every possible effort made to secure surfaces which will not retain dust, and that are easily cleaned.

Prevention Better Than Cure.

The floors of the cars are of monolith, which is waterproof and non-absorbent. Smoking and toilet rooms are equipped with rubber tiled floors, and the closets with enameled rubber sheeting.

Draperies have been done away with. Woolen fabrics for the curtains have been replaced by pantosote, a smooth imitation leather. The plush coverings of seats are made so as to be readily cleansed by the vacuum process, which sucks all the dust out of them.

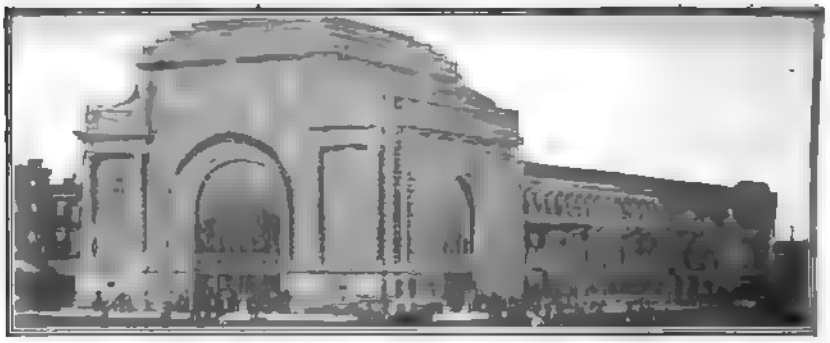
Cleaning.

At the end of each trip all windows, doors and deck sashes are opened, and kept so as long as possible, to gain free circulation through the body of the car. All carpets, the seats and backs, the adjustable arm pads, the head rests, pillows, mattresses, blankets and curtains are removed to cleaning racks outside of the car, where they are exposed to air and sunlight, and then thoroughly cleaned by compressed air.

The body of the car, the interior woodwork and the windows are cleaned. Special attention is given to cuspidors and toilets, which are sterilized after the trip.

Health Measures.

No person with a virulent or contagious disease is knowingly admitted to the cars, and on routes to health resorts, particularly in the case of consumptives, no berth which has been occupied by such a person is sold until the car has arrived at its terminal. Cars, including bedding, furniture and everything else used by consumptives, are fumigated at the end of each trip by the use of liquid and solidified formaldehyde.



A Splendid Terminal, New Orleans.

In the case of a contagious disease breaking out on the car, the sick person is immediately turned over to the local health authorities, and the car fumigated and withdrawn from service for the proper period.

Thoroughness Necessary.

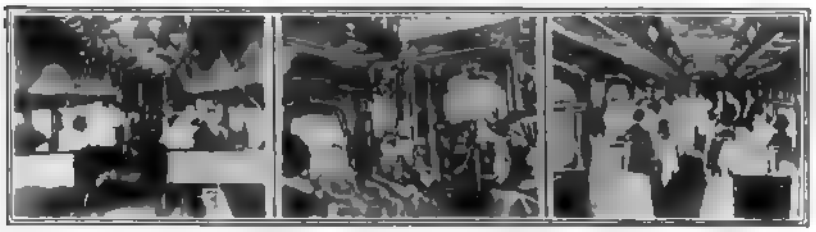
The preparations for a run of any length require much work. A housekeeper, if she finds that she requires anything, from food to a piece of furniture, can secure the same whenever the necessity arises, unless she lives in a particularly isolated section. But on

the Rail Road every possible contingency for perhaps an eighteen-hour trip must be provided for ere the train starts out, except the supply of fuel and water.

The gas tanks must be full, the electric batteries may have to be replaced; the inspection of car wheels and structure must be made. During the run the cars require constant attention. If it be winter, the cars must be better heated than any dwelling house, for cutting through the cold air at the rate of thirty or more miles an hour causes many a cold blast whose effect has to be overcome, and the ventilation must be such as to secure fresh air.

Our Many Wants.

Modern men and women are very highly developed. The many and varied desires of the human being are displayed in their full breadth on the Rail Road train. The Rail Road company with wise foresight seeks to prepare itself to carry out many of such wishes. Cards, books and magazines are kept on hand. One passenger desires a pillow; another requires a stimulant or medicine, or a third wishes to partake of his meal at his own seat.



SLEEPING CAR PARLOR CAR DINING CAR

Under the contract made by the Pullman Company with the Rail Roads, the latter merely carry its cars and the company gets the extra fare of half a cent a mile, in some cases receiving a guarantee of a given revenue per car. Accordingly, the Rail Road may even pay for the privilege of hauling Pullman cars. The Rail Road derives no benefit in the way of additional income for hauling Pullman cars, further than the revenue from passengers who may be induced to ride because of the greater comfort offered.

Greatest Hostelry.

The Rail Roads of the United States, directly and indirectly, are the greatest hotel keepers in the world. More than 50,000 persons of the 2,400,000 daily Rail Road travelers, eat and sleep in the Rail Road cars, in beds as good and with surroundings as neat and attractive as they find in their own homes.

Any man who has spent a winter night in an unheated car on a foreign Rail Road, being compelled to wrap himself up in rugs and to sit up in his seat, keenly appreciates the difference in the comfort of the American method of traveling and that found abroad in the old style car.

CONVENIENCES OF A MODERN TRAIN—LIBRARY, MANICURE, BARBER.

The Dining Car. The American dining car is one of the most wonderful institutions on the face of the earth. Here is a kitchen six feet wide and perhaps three times as long, traveling at a speed of three or four dozen miles an hour, which will supply its patrons, limited though they are in number, with a variety of foods that many restaurants with hundreds of customers do not surpass.

Rail Road directors are satisfied usually if the dining car pays expenses, though this result is not always attained.

Details. The cost of maintaining an extensive larder is very high, and as the meats, fruits, eggs and milk must be kept in the pink of condition, there is frequently waste of considerable quantities. The operation of the car requires the service of a cook, two helpers, usually five waiters, and a conductor.

The menu card must be prepared for each trip, the drinkables must be at a proper temperature, and the cigars kept moist. The linen must be spotless, and the china, silver and glassware must be dainty and well polished, for even on such small things may the reputation, good name, and passenger traffic of a great transportation company depend.

Conditions Abroad.

In Foreign Climes. Pullman service in the United States adds an average of half a cent per mile to the cost of traveling. A similar convenience in Europe, the Wagons-lit, operated by the International Sleeping Car Company, is not only considerably inferior to our sleeping cars, but is very much more expensive.

First, all of the express trains make an extra charge, called a supplement, of about 33 per cent for the special service rendered, which the Rail Road collects. Users of the Wagons-lit must pay this extra fare, besides the additional sleeping-car charge.

Extras. To what these extras amount may be judged from the fact that on the Calais-Constantinople express one is called on for $122 regular fare, with an extra fare of $35, and for the sleeping berth $26, a total of $183. The fare, including sleeping car, on a train from Chicago to San Francisco, a considerably longer distance than Calais-Constantinople, is only $72.60, or practically two-fifths of the foreign rate.

The Wagons-lit charge from Paris to Rome is $23.40; the sleeping-car charge between Chicago and Boston, about an equal distance, is only $5.50; the Paris to Marseilles Lits charge is $12.60, while the Chicago to St. Paul parlor-car charge is only $2. Similar comparisons might be given indefinitely.

Coming and Going.

When a passenger in Europe buys his ticket anywhere but at the station, the ticket agent charges him 50 to 75 cents additional. To reserve berths they must be paid for, and if the prospective passenger wishes to return his ticket later on, he can only do so by a personal arrangement with the ticket clerk, at the cost of a goodly proportion of the ticket value for the clerk's service. Even then, the clerk may sell the berth only after all those in the company's hands have been disposed of.

An unpleasant phase of the management of these cars is the method of selling berths. The sleeping cars are divided into narrow sections with respectively two and four beds in them. The berths are sold indiscriminately to men and women. To insure privacy, it is necessary not only to pay for all the berths, but to have a Rail Way ticket for each berth.

On the Delaware and Chesapeake Canal.

SECTION XXXII.

GOVERNMENT OWNERSHIP.

Would It Make for Progress and Prosperity?

The reason the United States has progressed with greater rapidity than any other country is that its legs—the Steam Roads—have been better developed, and are stronger than those of any other country.

Dual Benefits. Our Rail Roads carry for $1 the same load of freight for which substantially $2, and in some cases $3, is charged in other countries. Yet our Rail Roads pay for labor, the main item of cost, from two to three times as high a price as is paid in foreign countries. The double benefit thus enjoyed by our people—minimum rate of carriage and maximum wage, the most essential factors of progress and prosperity—has come about as a result of business competition.

Had our Rail Road building proceeded under government ownership or control, would it not, in all probability, have been like that of France, and our principal cities have been, like Paris,

the chief beneficiaries? Even that city has substantially only one road to the east, one to the west, one to the north and one to the south, instead of many roads in all directions, with numerous competing lines between all prominent centers,—like Chicago, with twenty-six entering it, and Kansas City and St. Louis with almost as many. Many of our smaller cities, or even the larger towns, have Steam Roads entering from more points of the compass than Paris.

Politically Difficult.

Under a republican government, administrations may change too rapidly to render possible any adequate conception or execution of a plan which would give an ample accommodation to the public and cheaper rates than we enjoy to-day.

Our cabinet officials, as a rule, are changed every four years, even though there may be no change of party in power or of executive. It is almost beyond human capability that a man absolutely new to his position can be executively as efficient as he who has been in the office for a number of years. We also have strong reason to believe that there would be many economies, if the several branches of government were private business concerns, with their present heads as managers personally interested and working with a united purpose, rather than for departmental ends.

Self-Interest Lacking.

European countries, even with their inferior results in operation as compared with ours, have as rulers, practically a class or order of people, and the under government officials are not changed with changes of party. There exists, therefore, a proprietary and property interest in public office which, to a certain extent, would be lacking in the United States.

Europe's Legal Rights.

Those inclined toward government ownership frequently offer, in confirmation of their views, the mere fact that Germany, Austria and Switzerland have taken over the various Rail Roads formerly owned by private corporations.

It is a matter of knowledge that in each of these countries the government's right to purchase the Rail Roads was provided for when the charters were granted. The transfer from private to public ownership was merely the execution of an option provided for in their agreements or charters and was, therefore, accomplished without friction, confusion or question of right.

America's Legal Rights.

In our own country, on the other hand, the state of Massachusetts alone has reserved the right to purchase the Rail Roads constructed under charters granted by it, the other states and the nation having provided for no such privilege beyond the right of escheat.

As a consequence, would it not be necessary to amend the constitution of the several states and of the United States before such rights could be acquired? This would probably entail a longer and far more disturbing agitation, fraught with much greater danger to our business interests and industries than the momentous question of the currency or the tariff.

Eminent Domain.

Should it be necessary to resort to the general powers of escheat possessed by all the states and the nation, it would be necessary for the national and state governments to act together and in harmony. The refusal of any of them to co-operate fully and freely with the others might prevent the carrying out of the general plan. In view of local jealousies, state rights, etc., it might easily take many decades to settle the differences between the several states in each region, and then between the various sections and the nation at large.

There would still be the menace of new lines built to compete with the government roads, which would have to be acquired by the government, increasing the investment and operating expense, while if private competition were forbidden by law then communities would be at the mercy of political action.

Some Physical Difficulties.

Another Story.

Besides the difficulties presented by absence of legal authority, and the grave question of the possibility of equitably acquiring such authority, there arises the question of the fitness or unfitness of a republican government to engage in an enterprise of this nature.

Contrary to general belief, if all the government Rail Roads in the world were consolidated, the aggregate would represent only about 30 per cent of the world's total mileage.

Irregularities.

Those favoring government ownership "point with pride" to the results obtained in certain foreign countries. A well-known writer gives a version differing from the popular one. He says that investigation of the diversion of public money for personal needs revealed the greatest irregularities.

Uneconomical Operation.

The questionable methods in the construction of the very roof and walls of the capitol that houses the legislative body of one of our greatest states present a striking example of what extraordinary outlays might occur under government ownership of Rail Roads in America. If the ruling powers cannot prevent fraud and dishonesty from creeping into the very chairs which they are holding down, the outlook seems unpromising for the honest and economical management of an industry with a host of persons, whose activities are in every corner of the land, far from the ken of those who supervise.

In view of the methods that ruled in the drawing and letting of contracts in the construction of the Pennsylvania state capitol, might we not find our locomotives bought by the pound, our freight cars by the cube, rails by the centigram, or the adoption of some other equally unusual and confusing measure, opening the way for favored individuals to reap millions from the public purse?

Wastefulness Run Mad.

How injudicious and unbusinesslike our public expenditures often are, is proven by many instances. For example, a good many thousand dollars were spent years ago in improving a river almost in the shadow of the national capitol. Nevertheless, after the locks and dams were built, not a half dozen flat boats, with a total of 500 tons of cargo, used this river. The improvements, locks and dams are now in ruins and useless, and the money they cost the government was absolutely thrown away.

Nor is the above an isolated example. The writer has in mind another very elaborate proposition that had a favorable report from official engineers. It was to make a port of a river city, several hundred miles inland. The writer has seen this river in summer, when a moderate-sized herd of cattle could have drunk all the water flowing through it, or rather the water standing in pools, the only evidence in view to mark its course.

Making Navigation.

Obviously impossible as the whole project seemed, it was suggested in all seriousness that wells might be bored and water pumped into the upper part of the river bed in summer, so as to enable the proposed locks to be operated. This would have been injecting water, or making slack water navigation, with a vengeance.

THE NATIONAL TURNPIKE, MARYLAND TO INDIANA.

The Moral Equation.

Before our governing powers venture on a problem so deep and complex as the ownership, construction and operation of Rail Roads, should they not demonstrate their ability to build and maintain good ordinary roads and highways?

Discouraging Outlook.

If the condition of our common roads be a fair criterion of state energy, enterprise, ownership, operation and maintenance of public works, the most uncompromising public ownership advocate must admit that there would seem to be danger of losing much and gaining little by putting the management of our transportation systems into such hands. In just what condition the highways of the country are may be learned by referring to our section "Good

Roads and Bad Roads." Their condition gives a good idea of the policy and enterprise exhibited in this class of public improvements.

It would seem that in the event of a change to government ownership, we would need men of broader gauge and wider and more specialized experience, men accustomed to larger undertakings than many of those frequently placed in charge of our national business affairs, and with some practical knowledge of the business which they are to conduct.

Political Intrusion.

Such things as river, harbor and public building appropriations, known as political "pork barrels," against which President Taft and many of his predecessors have set their faces, would be subject to the politician with the longest pole or the biggest pull, who usually gets the most persimmons for his constituents. The states considered "politically doubtful" are catered to by the politician, and frequently fare better than the rock-ribbed states, either of the dominant party or the opposition. The size of the "pork barrel" under government ownership of land transportation systems, instead of $100,000,000 would be probably $600,000,000 per annum.

Under government ownership sections of the country, perhaps more in need of Rail Road facilities than the ones favored by the politicians with a pull, or by the dominant political party, would be compelled to suffer, waiting until the game of politics had been played. Probably they would not get the required facilities until years had been spent in "log-rolling," and then possibly only through "a trade," by a promise of their representatives to support someone's else pet measure. The committees and calendar of Congress are full of meritorious bills and measures which have been "under consideration" for 10, 15 and even 25 years, and never have been finally acted upon.

Danger to Our Institutions.

Another practical and even more serious consideration is the fact that to the 365,000 persons now employed by the government enough would be added to bring the total number up to substantially 1,900,000.

They would compose a vote sufficient to have changed the result of almost any election we have had. Adding the brothers, fathers, friends and others interested in or dependent on them, these combined would constitute a vote of such proportions as gravely to menace our republican institutions.

Undue Power.

The party in office would seem likely to be there to stay, whatever its shortcomings might be, how contemptuous soever its attitude toward the public in general. It would seem practically impossible to drive it from office; it would invite individual usurpation of power, such as we have had frequent examples of among our neighbors farther south.

Patronage has been a curse to governments as well as parties. With a patronage of $1,000,000,000 per annum, or $3,500,000 for each working day, and a total disbursal of approximately $3,000,000,000, how long would it be before there would probably be a taint in our political life and public affairs?

Government Moves Slowly. Another point is that the government, like all great bodies, is inflexible, moves slowly and along the biggest lines. It is too big to meet the thousand-and-one contingencies arising in each section.

The letter postage rate has not been changed for 30 years despite the enormous increase in business, though many transportation rates have been cut in half in the same period; neither was the pay of army officers increased in 30 years.

Equitable Operation. Included in this physical question comes the consideration whether any man could successfully operate all the Rail Roads in the United States. The ablest men we have succeeded in finding among our Steam Road presidents, each with an efficient and carefully selected and trained staff of vice-presidents and other assistants, few of whom are paid as little as our vice-president or our Cabinet officers, have found that it takes all their time to operate systems consisting individually of a small percentage of the country's total mileage.

The demands of the various sections of the nation vary quite as much as those of the different countries of Europe. Could we imagine a single man successfully, satisfactorily and economically operating all the Rail Roads of Europe to the best interest of the people of each country?

Size Detrimental. It would seem impossible for any man to manage a system successfully unless he has been over it to learn what he is handling. The manager of the great American system of government Rail Roads, if he traveled half his time and worked the other half, would spend about eight years making one complete trip over the lines. In the meantime, commercial conditions would have changed a number of times and the information gained during the first part of the trip would be useless at the end of it.

Perhaps the most serious feature of the proposed change is the fact that the acquirement of our Rail Roads would cost the government about $14,000,000,000, an amount six times as great as the national debt created by the civil war. The civil war hurt us so severely and lowered the credit of the country to such an extent, both at home and abroad, that $2.75 in greenbacks would buy but $1 of gold, and government bonds were sold at 50 cents on the dollar.

The Dangers of a Great National Debt.

Legislative Lethargy. Our people have acquired extraordinary caution in regard to expenditures for public works. This is exhibited in the half-hearted manner in which legislative bodies handle propositions to undertake improvements. The slowness with which they move is evidenced by the fact that Congress debated for many years before deciding to build any interoceanic canal at all, either by the Nicaragua or the Panama route.

The matter had been the subject of discussion on and off for 50 years, and yet the original estimates for the work involved a total expenditure of less than our Steam Roads disburse every month.

Penny Wise, Pound Foolish.

Our legislators will not agree upon the continued policy of spending the comparatively trifling sum of $20,000,000 additional per year for a period of years, on the construction of a certain class of ships for a new navy. Appropriations for public buildings, roads, rivers and harbors are made piecemeal, and the construction of such facilities often takes years.

In years of financial depression there is the least desire to make any expenditures, and politicians at such times, fearing public criticism, are loath to make any appropriations for public improvements, even those under construction. A Rail Road built under such methods would depreciate in value or become antiquated before being finished, as did some of our earlier Rail Roads constructed or aided by the states.

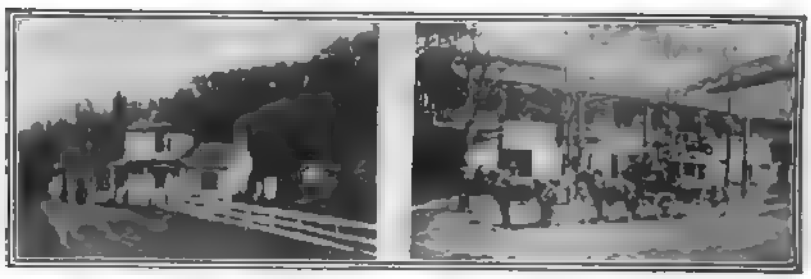
Lack of Confidence.

It is safe to say that any political party committing itself to the policy of spending from $5,000,000,000 to $10,000,000,000 for Rail Roads during a period of, say, ten years, would be voted out of power and declared reckless and unsafe to entrust with the management of the country's affairs. Yet, though the Rail Roads are spending such sums, they are still hardly able to meet the transportation needs of the people.

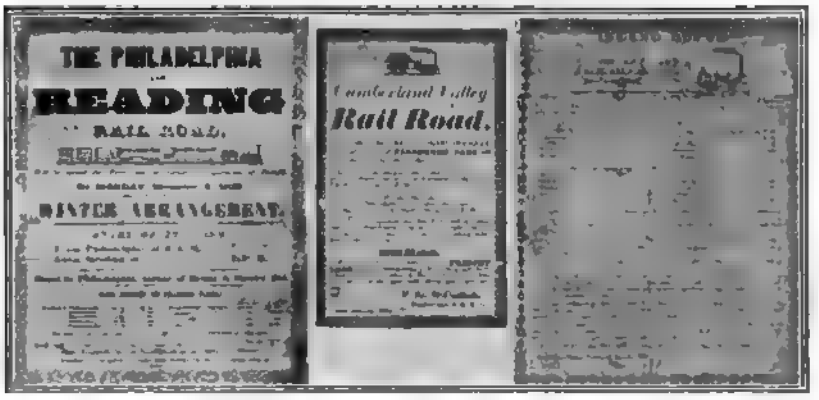
There are three dangers to be feared in connection with the expenditures made: niggardliness of appropriations, lavish and injudicious expenditures and extravagance in management.

How dangerous the acquirement or the operation of Rail Roads by our states was regarded 75 years ago may be understood from the fact that when the Philadelphia and Columbia Rail Road was established it was regarded as reprehensible for the state even to own the tracks and the locomotive at the same time, as creating a government monopoly dangerous to the rights and liberties of the people.

SCENES ON THE CUMBERLAND ROAD BUILT WITH GOVERNMENT AID, TO BE THE GREAT HIGHWAY TO THE WEST



TOLL GATE, NATIONAL TURNPIKE. STAGE COACH.



READING TO PHILADELPHIA, $2.50 HARRISBURG TO PHILADELPHIA, TEN HOURS. EARLY TIMETABLES

The Great Inducement. It is an accepted adage that everybody's business is nobody's business. On the other hand, it is true that personal and self-interest are the strongest incentives to achievement, economy and good management.

Henry V. Poor, the economist, writing 30 years ago, said: "The government cannot supply the inspiration, the diligence, the zeal, the economies necessary either to the proper service to the public, or financial success."

Confederate Depreciation. The story of the depreciation of Confederate money and how much of it was required to buy even the ordinary necessities of life is too well known to require repetition here. It can be imagined how disastrous would be the creation of a debt nearly six times as great as that of the civil war.

It may not be amiss to mention here that during the revolution likewise, our government had to contend with the problem of a depreciated currency, and all the difficulties growing out of such a condition. General Washington at one time said: "It would take a wagon load of our money to buy a wagon load of provisions." That such was substantially the case is seen from the fact that at one time tea cost $90 a pound, butter $8 a pound, corn $15 a bushel, and flour $1,575 a barrel.

Continental Currency. Bancroft says there was a period when $10 of Continental money would buy but one cent of real money. Currency was of such little value that requisitions on the various states were for provisions, uniforms and ammunition, rather than for money.

We are reminded that the expression "not worth a Continental dam" is not by any stretch of the imagination to be classed among profane words. The depreciation of Continental currency was so great that much of it was practically worthless, and across the face of such money was written the Latin word "damnatus"

—condemned. This led to the use of an expression which, while not improper, is a good substitute for a less polite expression that is said to be an excellent safety-valve for overwrought feelings.

An Example of Government Control.

Red Tape.

The average American when he finds something wrong, likes to kick and get some result, but the American who has made a complaint against public service of one kind or another and who has waited patiently until the regulation amount of "red tape" could be unwound before he received proper attention, can perhaps picture to himself what the situation would be in connection with complaints against government controlled and owned Rail Roads.

If one has made a "kick" against foreign Rail Roads, and has been met with the hauteur, if not insult, of the European government Rail Road official, he will realize the difference between private and government service.

A French Train. An Old and New Engine in Use on a French Railway.

The inconvenience and inflexibility of government control of Rail Roads was impressed upon the writer most forcibly one afternoon when he landed at a French port from a trans-Atlantic liner, only a few minutes after the regular train had left for Paris. Several hundred people were compelled to wait for three and a half hours until the scheduled time for the next train to start.

Long Windedness.

Special trains had been made up and were waiting for us, but we were advised that if the president of the republic of France were waiting to go, no passenger trains, except those regularly scheduled, could be run without a meeting of the directors of the road and a special permit from the government, involving months of delay.

Each of the trains in waiting was in charge of five officials who, judging from their uniforms, were at least vice-admirals. They looked important enough to be entrusted with the command of all the fleets of France, but could do no more than run the trains into a freight yard and hold them there until the time came to start the next regular train. Then we were allowed to leave for Paris, a distance of 150 miles, at an "express" speed and with only one stop, making the run in seven hours.

Impossible Here.

Imagine the American sovereign citizen, while en route from New York to Boston via the Fall River line, and after only 10 hours, instead of six days upon the water, arriving at Fall River or Providence, owing to a fog or some unforeseen incident, a few minutes after the regular train for Boston had gone out, and being compelled to wait from six in the morning until half-past nine before he could start on his journey, although the train has been ready to proceed all this time.

When we make changes it is ostensibly for something advantageous, not for something worse. What manufacturer in the United States would adopt a machine that a thorough test by his rivals had proven to be faulty in operation and unable to produce goods except at a much higher cost than his own methods entailed? It would seem that the adoption of government ownership of Rail Roads by our people might be more hurtful than beneficial.

A Death Blow to Unions.

It has been claimed that the issuance of injunctions in cases of strikes has been hurtful to the cause of organized labor. Be this as it may, these injurious effects are as naught when compared with what would be the results of government ownership, which would destroy labor unions so far as effective usefulness to their membership is concerned.

The feeling of some of our largest laboring interests toward government ownership is well expressed by the utterances of a number of their most prominent leaders.

Labor's Attitude.

The late Peter M. Arthur, former grand chief engineer of the Brotherhood of Locomotive Engineers, in discussing this question, said: "If any of the employes of our Rail Roads want to try the experiment of government ownership and operation, let them enlist for three years in the regular army. Their experience in that service will not differ materially from their experience in any subordinate position on a government owned and operated Rail Road."

Chattels.

E. E. Clarke, former grand chief conductor of the Order of Railway Conductors, now Interstate Commerce Commissioner, said: "The employes of American Rail Roads are opposed to government ownership, because they are opposed to being owned."

P. H. Morrissey, former Grand Master of the American Brotherhood of Rail Road Trainmen, in an interview said: "For a period of fifteen years the Rail Way Mail postal clerks failed to get a single advance in their pay or any marked improvement in their conditions. The letter carriers in cities had the same experience. Meanwhile the wages of brakemen were doubled."

The Eleventh Commandment.

An executive order issued by President Roosevelt, under date of January 31, 1902, reads as follows: "All officers and employes of the United States of every description, serving in or under any of the executive departments, and whether so serving in or out of Wash-

ington, are hereby forbidden, either directly or indirectly, individually or through associations, to solicit an increase of pay or to influence or attempt to influence in their own interest any legislation whatever, either before Congress or its committees, or in any way, save through the head of the department, in or under which they serve, on penalty of dismissal from the government service."

Strikes.

A strike in the service under government ownership would disrupt a contract with the government. Preventing others from working, one of the strongest weapons in the hands of strikers, would be rebellion.

All strikes would probably be as futile as the recent postal strike in France, where soldiers were ordered to take the place of the strikers, causing the whole agitation to fail woefully.

A suggestion for taking the management of the public service corporations out of private hands is for state ownership of branch and feed lines, and for national ownership of trunk lines. This would probably cause even more clashes of self-interest than the proposal to have the government take over all the lines, and it would be next to impossible to harmonize them.

The Human Equation.

But, were such a plan adopted, we should probably find the people of each state shipping produce, whether with local or far-away destinations, over their own roads, and getting as much mileage upon them as might be secured, ignoring the government lines as far as possible. Would not this result in the disruption of the dual system, in conflicts between nation and state, in the renewal of the disputes about state rights and federal rights, if indeed it did not end in chaos?

Someone has said that no government in the world ever has produced or ever can produce anything, and that all governments are necessarily consumers only, every dollar they spend being taken from the resources of some home, every hand they employ heightening the price of some necessity, and everything they give to those in favor, taking away something from others.

Faith in the Founders.

Be this as it may, it scarcely will be disputed that the fathers of the republic and the long line of brilliant statesmen who followed them knew, perhaps as well as those who constantly advocate changes, to what extent a government may be entrusted with authority over matters affecting the rights, liberties, activities and prosperity of the people; and by their public acts and utterances they ever advocated the doctrine that "that government is best which governs least."

The struggles in Russia, between the Progressives and the Reactionaries; in Turkey, between the Young Turks and the old régime, and in Persia, between the old and new factions, are but struggles with the problem of over-centralization of power and an over-burden of government.

Too Much Government.

Yet ownership of our public utilities would give our government more absolute control over the progress and prosperity of our people than is exercised by the czar, the sultan or the shah. And should we ever happen to have as officials men of the type which has dominated some of our neighboring nations to the detriment of their progress, the condition of our people might become akin to that of the subjects of the most unprogressive old world sovereignties.

The Question Stated.

Government ownership of our Rail Roads would call for so radical a change in the policies of the nation; for the transference of ownership of such a vast amount of property; for the creation of so large a national debt; for the abandonment of the policy advocated by the authors of the Declaration of Independence, of having the least possible degree of paternalism in the enterprises, machinery and activities of our government, that it is not astonishing that the mere discussion of it has a tendency to disturb and halt the course of progress and prosperity.

Weighty Opinion.

President Taft, in a speech to Rail Road men in Chicago, on September 23, 1908, said: "I do not know how the Rail Road employes would like government ownership. I am unalterably opposed to it. It would lead to a management of Rail Roads not nearly so effective as that which we have under private ownership, and it would involve the government in an enormous debt."

There is no desire to present an argument on this question. The theory of government ownership of Rail Roads is attractive. The complications and practical difficulties developed by an analysis, however, appear worthy of serious consideration.

Concrete Examples of Public Extravagance.

In Our Metropolis.

The great city of New York seems to provide a caution, at least, of the lack of efficiency and economy connected with public ownership.

The city created a bureau of municipal research for the purpose of discovering the leaks in the city's disbursements. This bureau collected facts of much interest in reference to the expenditures in running the city government, and it is worth the reader's time to familiarize himself with them. The figures are all incontrovertible, having been obtained for the purpose of serving as legal evidence.

Doubly Costly.

For instance, there was a certain clock, which, because of its laggard tendencies, served to enable the employes of the city to start their work at a time of day which that clock alone proclaimed to be nine, although all other chronometers had left that mark some half a hundred minutes previously. This timekeeper cost $10 originally, and when some extraordinarily conscientious official gave orders to have it repaired, five hours and twenty-five minutes of labor at a cost of $64, were spent in fixing the $10 clock.

The city bought 165 books at 65 cents each, the retail price of which, at any shop, was six cents each. It cost $2.21 additionally to bind each of these six-cent books.

Rubber Hose. The city paid $463.78 for some rubber hose, for which the dealer who sold it had paid $191; and at a fire test the hose was found to possess not a tithe of the elastic qualities which distinguished its price.

Cleaning the city buildings, 1902 to 1907, cost $149,906 per annum. The American House & Window Cleaning Company offered to do the same work for $43,000, a saving of $106,000 on a $149,000 bill.

Cleaned Out. At the Bronx Borough Hall, at 177th street and Third avenue, the cleaners found that by hard work each could only clean one and a half modcrate-sized offices per day. The cost amounted to $378 per room per annum. The yearly cost of cleaning the building was $19,707, although responsible parties offered to do the same work for $1,800, a saving of $9 out of each $10 paid.

Education. In the matter of school supplies, even buying at retail instead of using the city's method, would have effected a saving of $633,000 out of $1,800,000, $1 out of each $3. The entire supplies provided for in the budget of 1908 amounted to $15,000,000. A saving at the proportion named above would have meant $5,000,000, or the interest on $125,000,000 back in the pockets of the taxpayers.

In the condemnation of certain lands which were necessary for public improvement, the first value placed upon them was $1,142,000, but when this valuation was attacked it was reduced $400,000.

Costly Grazing. It would seem to be difficult to find a piece of more colossal "extravagance" than in the purchase of a farm for the horses of the mounted police squad of New York. It consists of 22½ acres, near Flushing. On September 23, 1906, it sold for $22,125. On November 2, 1906, it was sold to the city for $105,000, or $83,800, 400 per cent profit in 40 days.

Stands rented out by the city, which had been going to political favorites for $1,200 a year, were found to be worth $8,400 a year when put up for public letting. The revenue from another one, which had been $360, was increased to $2,500.

One Place for Low Rent. Claremont, a building in one of New York City's parks, some years ago paid $6,300 a year, and at the time of the report was bringing in only $2,400, although its restaurant probably takes in as much money as like institutions in the city paying private owners from $15,000 to $30,000 a year rent.

In one of the boroughs it was estimated that one dollar out of every two was for unnecessary salaries. The city paid out in a single year $60,000,000 for wages, and her own comptroller said that a fourth to a third of the departmental force could have been cut off, and from $15,000,000 to $20,000,000 thus saved to the tax-

payers. This sum is enough to pay the interest on half the city's debt.

Protection.

Even the "City Record," the city's publicity organ, whose apparent purpose was to help call attention to corruption and frauds, upon examination by a committee appointed by Mayor Gaynor showed graft in its management, probably excelling that of any other city department in proportion.

The tenement-house department has set out to eliminate dark rooms. It is said that at the present rate of progress, although there is a large force, 89 years would be necessary to complete the task.

Out of each $100 received in taxes the city pays out $28.16 in interest. Unpaid taxes amount to $30 for each man, woman and child. The tax rate of 1907, $1.48, was increased to $1.77 in 1908. The 1910 rate was $1.81.

Paying the Debt.

The interest on the public debt increased from $12,000,000 in 1902 to $24,000,000 in 1908, or 100 per cent, while the population during the same period increased but three per cent a year.

The increase in interest of 1902 over 1901 was $334,000, but the increase of 1908 over 1907 was $3,776,000, or more than 11 times as great.

In a recent year, when the receipts of the United States government were $665,306,000, of which it spent $578,000,000 for operation, the receipts of the City of New York were $326,000,000, although it spent $328,000,000, causing a deficit of $2,000,000.

The employes of the city of New York number 56,692, while there are only 78,782 men serving in the United States army.

Increasing the Debt.

This whole story can perhaps best be summed up by an examination of the record of corporate stock issued, showing the increase in public debt. For the two years or twenty-four months of 1904 and 1905, the increase was an aggregate of $44,000,000. For the first three months of 1908 it amounted to $40,000,000. In fact the total bonded debt of the city is two-thirds as much as the debt of the whole United States. At the beginning of 1911 a single issue of $60,000,000 was planned.

New York City also presents an example of extravagance in the municipal ownership and operation of a public service facility. A few years ago the city took over the Staten Island ferry, crossing the bay from Manhattan to Richmond borough.

A Public Carrier.

In the first year the operation of this ferry, which had been profitable under private ownership, showed a loss of $1,000,000, or the interest on $25,000,000 at 4 per cent, the rate at which the city usually borrows money.

New York is not the only example available. San Francisco, St. Louis, Chicago, Pittsburg and other cities, and the legislative bribery scandals in several state legislatures are sufficiently fa-

RECREATION PIER, 50TH STREET W., AND NORTH RIVER, NEW YORK. ONE FIELD FOR CITY OWNERSHIP.

miliar to add considerable weight to the statement of the weakness of a publicly conducted business.

Proof of the Pudding.

Perhaps the best proof of the fact that these things, at least so far as New York is concerned, were unnecessary is offered by the fact that the administration headed by Mayor Gaynor immediately effected substantial economies.

Still, if such things can occur with nearly 5,000,000 people immediately around, when numerous public organs keep a watchful eye, with a capable and conscientious comptroller endeavoring to prevent leaks, how great are the opportunities for extravagance in the ownership and operation of the public service facilities of the nation.

HOW IT WORKED: OUR EXPERIENCE IN STATE OWNERSHIP OF RAIL ROADS.

Let us see what was the progress and prosperity in those commonwealths which experimented with this suggested remedy for our transportation ills, the state ownership of Steam Roads.

Pennsylvania the Pioneer.

On March 28, 1828, the Pennsylvania legislature authorized the construction of the Philadelphia & Columbia Rail Road from Philadelphia to Columbia. It was not until six years later that the line was completed and put into operation. The road early became a very important and useful part of the political machine, resulting in a disgraceful condition of affairs. To quote a chronicler of the time: "All branches of the government were corrupted by it, and the credit of the state collapsed."

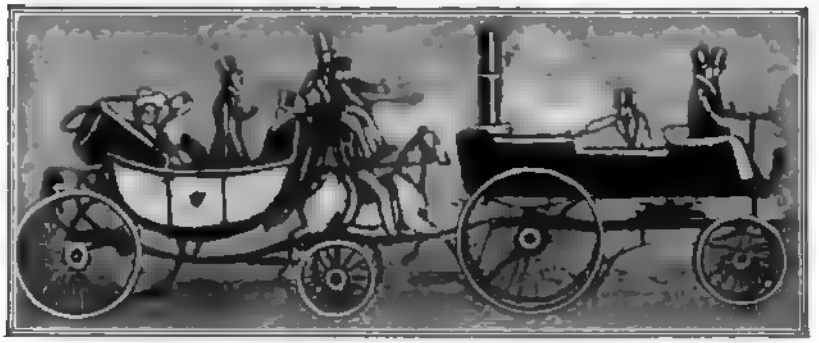
A historian of that day said: "The road is used as a means to corrupt the electorate, the employes being mostly political heelers, whose duties practically consist of signing pay-rolls, paying political assessments and voting for the party in power.

Bribery of Electors.

"It is a common sight on election day to see a gravel train, filled with repeaters and with a 'dough bag' stowed away in a corner, moving from town to town along the line, either the repeaters or the dough bag, or both, being utilized at the different polling places

in the interests of the political machine. On pay days a representative of the political association stands by with a bag when the men are receiving their wages, and boldly collects contributions from all the laborers.

"Freight is divided into four classes, and one of the lashes wielded by the politicians to punish shippers displeasing them is by arbitrarily classifying shipments at higher rates than the freight should go under. On the other hand, the transporter who is 'in right' politically can have his goods favorably classified or almost the whole amount of his freight charges rebated."



A Primitive Steam Steed Racing a Four-footed One.

Popular Uprising.

After standing such abuses for a number of years, the system that was sapping the political life of the state was overthrown by the election of a legislature that ordered the Rail Road sold at public auction. "Accordingly, the so-called 'public' works were disposed of to a private corporation at a price considerably above their value, but only one-fourth of what they had cost the state."

That with lapse of time human nature has not grown better, nor politics purer in the commonwealth of Pennsylvania, is proved by the scandals connected with the construction of the state capitol, in the building of the Philadelphia city hall and the city filter plant, and in connection with certain franchises and the placing of city bank desposits in Pittsburgh, all of which are discouraging signs.

How Some Southern States Fared.

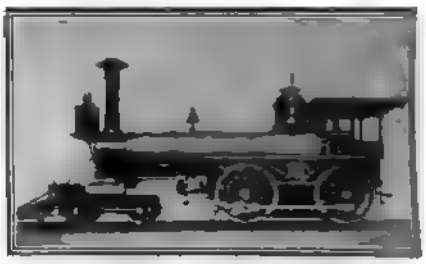
North Carolina.

In order to help in developing its natural resources, the state of North Carolina invested heavily in eight Rail Ways. Two of these, the North Carolina and the Western North Carolina Rail Roads, were operated for years under what might be termed state ownership. They became "political footballs," and neither the state nor the individual security owners received any return on the money invested until operation of the roads was surrendered to a private corporation.

The substance of North Carolina's experience is that an enormous amount of money was expended on a number of roads,

but in no instance was the result successful. The state now owns stocks in only two Rail Roads, and these are leased to private corporations, in order that they may be removed from politics and operated properly and purely as business enterprises.

WESTERN RAILWAY OF N. C., 1866.



A SOUTHERN ENGINE OF THE 60'S.

Virginia. Virginia, as the result of the unfortunate and disastrous investment in public service and Rail Roads, had a larger debt than any other state in the Union. A stigma was placed on the state's credit for a while, when the commonwealth was forced to go into bankruptcy and repudiate the debt. Her bonds at one time sold for a few cents on the dollar. To redeem the readjusted debt nearly broke the backs of the taxpayers and acted as a pall upon the state for many years.

While the state was in the hands of the politicians as a result of the power they acquired in connection with the operation of the Rail Ways, one of the most prominent once was asked the meaning of the letters "A. M. & O." upon the cars of the Atlantic, Mississippi & Ohio Rail Road, in which the state was heavily interested. "It means," he replied, "All Mine and Otelia's," the latter being the name of his wife.

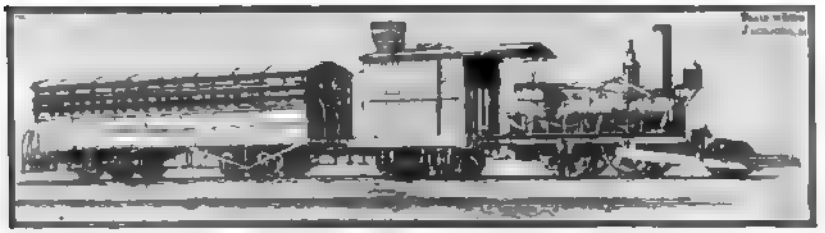
Tennessee. Tennessee had a disastrous experience, expending directly or indirectly about $28,000,000 in aid of Rail Road construction, which sum represented very much more in those days than at present. The entire amount was wiped out, the credit of the state going with it, and years of pinching and scraping were necessary to make up for the voyage into the sea of public ownership.

An Example of Throttling Under State Ownership.

Cincinnati. For many years the city of Cincinnati was cut off from participation in the trade with the territory south of the Ohio river by the refusal of the people of Kentucky to permit the construction of the Cincinnati Southern Rail Road through their state. The road was planned to cross Kentucky and Tennessee to Chattanooga, which is almost on the Tennessee-Georgia boundary. The refusal was to favor the city of Louisville, Cincinnati's commercial rival. When permission to build was finally granted, it was under an agreement that the Cin-

cinnati Southern should pay a tax of 50 cents a head for passengers carried across Kentucky.

The road was completed to Somerset, Ky., 158 miles from Cincinnati, in the summer of 1877, and to Chattanooga in the early part of 1880. It cost the city of Cincinnati $18,000,000. In its construction and in its operation, as in the political evils it caused, the enterprise was a heavy burden to the taxpayers, one under which they would be staggering to-day had not the city been fortunate enough to lease the road on favorable terms to a private corporation in the latter part of 1881.



THE LOCOMOTIVE JOHN BULL AND CAR, CAMDEN AND AMBOY, 1845.

Michigan. Michigan also had her experience, which we will not follow in detail, but merely state that she was glad to sell her investment of $4,500,000 in a single road for about 35 cents on the dollar.

The Northern Cross Rail Road, fifty-seven miles long, was built by the state of Illinois, under an act approved February 27, 1837, appropriating $10,237,000 for internal improvements. This imposed a debt of $343.10 per capita upon the poor people of the state. Chicago then was a village of 1,470 inhabitants and had to have a garrison to protect it from the Indians.

Go-As-You-Please Plan. The road was completed February 15, 1842. It was operated under a system that was truly go-as-you-please. Anyone who had freight to ship dumped it anywhere along the track and the trainmen loaded it upon the cars when they came along. One day the engineer ran "the" locomotive off the track on the prairie, and it lay there for nearly a year, the operation of the road being suspended in the meantime.

The road was a financial wreck, involving the state in a debt of $4,107,746. What was left of it—a section 24 miles long—was sold at auction on April 26, 1847, for $20,000, payment being made in state bonds which had been bought for nine cents on the dollar and were turned over to the state at par. It would seem difficult to find a more interesting example of "high" or "low" finance, or an instance of the wiping out of money invested in a Rail Road, to exceed this.

There are many other examples of state or city ownership of or interest in Rail Roads, but the results have been in the main similar to those in the cases of which we have given details.

EXCAVATION FOR PEDRO MIGUEL LOCKS, PANAMA.

Our Own Experience in Government Ownership.

Our Experience. We need not necessarily go abroad to see how both public and nation fare under government ownership, or whether the rates under such a system are lower or higher than those of private enterprises. We can learn these things by looking over the fence into our own back yard, for our government owns and operates a Rail Road.

The United States authorities purchased the Panama Rail Road for practically $60,000 a mile, including the road's bonded debt. Considering that its track and equipment at the time were third-class, the price seems a stiff one. The subsequent lending of money of the United States to the Rail Road increased this sum.

Disproportionate Payments. The government, soon after taking over the Rail Road, paid considerably more than their inventoried value for certain steamships needed in connection with the Rail Road, and immediately after spent more than they had cost to repair them. If we may judge from this, government ownership of Rail Roads would not result in any strict economies in purchasing desirable adjuncts.

In spite of the fact that American lines run between New York and Colon, contracts were made with two foreign lines for service between the two points.

Comparative Expenses. The results obtained under our own government's operation of a Rail Road were substantially as follows: the operating expenses of the Panama Rail Road in 1904, before it was operated by the government, were less than 51 per cent of the receipts. In 1905, after the line had been taken over by the Government, it took 63½ per cent, and for the four months ended October 1, 1905, it cost nearly 77 per cent of the full receipts to pay operating expenses.

In the first year, under governmental control, the rate on freight averaged 14 cents more per ton than in the year before; the cost of hauling coal went up 50 per cent; the commercial business increased 83 per cent, mainly because of Government canal work, and yet the Rail Road earned approximately $100,000 less.

When the Canal Is Finished. What the effect would have been without the artificial stimulus due to the traffic created in connection with canal construction and the supplies for the thousands engaged upon the work can only be surmised.

The dividend paid was reduced to 5 per cent and left only a $4,000 surplus.

Freight Rates. The average rate charged for hauling a ton of freight one mile over this government road is seven and seven-tenths cents, over ten times the average charged by the privately owned Rail Roads of the United States.

The passenger fare across the Isthmus—about 60 miles—is $7.80, or 13 cents per mile. Baggage costs five cents per pound for anything weighing more than the minimum which the passenger is permitted to carry.

A Cruel Suggestion. It has been said that "it is a misfortune for the shipper that this Rail Road is not under the jurisdiction of the Interstate Commerce Commission, so that it might determine what would be a reasonable rate."

The high rates charged on this Rail Road, the quantity of the government traffic and the poor results obtained seem to indicate that the Panama Rail Road is giving operating results that few privately owned Rail Roads could bear for any length of time without bankruptcy or materially increased rates.

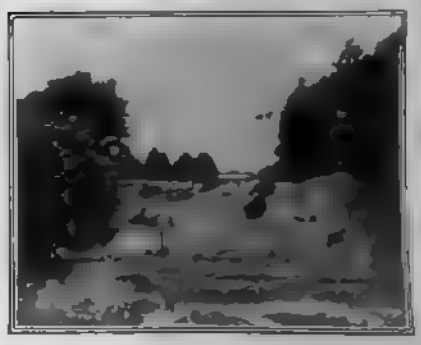
Where the Fault Lies. These statements, taken from official reports, indicate the results of government ownership in practice. So far as this case is concerned, it seems that not the managers of the enterprise, not the individual nor the public, but the system is at fault.

The veteran senator, Aldrich, has said that the government could be run for $300,000,000 less than its management costs at present, which would be a saving of almost one dollar out of every two now spent. If this be typical of government management, there would seem to be poor encouragement for improved economic results by entrusting our public utilities to it.

Outlook Discouraging. If there is $300,000,000 extravagance in the management of the national government, a large part of the expenditures being made at Washington under the eyes of public officials, what might be expected when the expenditures are increased six-fold, and the business activities extended practically to every point in the land?

SURVEYORS CAMP.

CLEARING AND GRUBBING A RIGHT OF WAY
(J. G. WHITE & CO.)



SECTION XXXIII.

THE UNSEEN EXPENSES OF THE RAIL ROADS.

The Rail Roads as Spenders.

Producer and Consumer.

In following the story of progress and prosperity, we are prone to forget sometimes that the consumers or spenders—in other words, the buyers—are substantially as important as the producers—the sellers. Should we overlook the fact that in the capacity of spenders, the Steam Roads occupy almost as important a place as in any other department of commerce or industry?

Hamilton "smote the rock of national resources, and copious streams of wealth poured forth"—but the Railed Roads have out-Hamiltoned Hamilton. Compared with the "copious streams" released by Hamilton, the wealth that pours forth from our public transportation agents comes in torrents.

Floods of Wealth.

The total receipts of the government in 1800, when Hamilton's measures were well in force, were $30,000,000, only one cent for every dollar of what American Rail Ways disbursed in some years, including new money for extensions and improvements. In a twelve-

months' wages, or for the elimination of obstacles, roads have spent more than kings' ransoms, more even than all the riches of regal treasuries. As money spenders our Rail Roads outrank many of the greatest governments combined.

The national debt in 1780, after the assumption of the debts of all the states, was $75,000,000. In 1906 one road, the Pennsylvania, spent, in round numbers, $70,000,000 for supplies alone.

Expense of Eight Years.

From 1900 to 1907 one company spent on permanent way, including straightening and elevating tracks, reducing grades and improving the road and rails, $160,000,000 charged as operating expenses, besides disbursing $268,000,000 charged to capital account, spending a total of $428,000,000 on permanent way on its old lines, besides $63,000,000 for right of way and real estate for new lines. There were spent, therefore, exclusive of operating costs, $491,000,000.

Out of $247,000,000, the annual earnings of the New York Central Lines, $212,000,000, or 86 per cent, is distributed in wages, taxes and interest, and for equipment and material. The disbursements of this road for 1907 exceeded the total army and navy appropriations of the United States for the year by millions. The Rail Roads thus put back into circulation, through some channel or other, practically everything they take in.

ROCK FOR CONSTRUCTION

The Percentage Spent.

The Rail Roads of the United States earn close to $2,500,000,000 per annum. Out of every $100 of this vast amount $54 immediately is redistributed in wages, taxes and for the purchase and maintenance of equipment and material.

The army of more than 1,500,000 men directly employed is augmented by two million other men, whom, indirectly, the Rail Roads furnish with employment in coal mines, locomotive works, car shops, rolling mills, saw mills, and the many other industries for which the Rail Roads are the market.

Customers of All.

The variety of expenditure required of Rail Roads is astounding. The purchasing agents of large roads buy from 5,000 to 10,000 different articles. To compile a list would be almost an endless task.

Their expenditures, justly called colossal, affect all industries; in the purchase of rails, for instance, their purchases influence the output of rolling mill and furnace and of coal and ore mines, af-

fecting both owner and laborer in each instance. In satisfying the necessities of these as consumers, the farmer, the lumberman, the brick manufacturer, the storekeeper, dispose of their products, and thus a million hands are reached.

A Losing Venture.

But there is unseen money of another sort in Rail-Roads—the money invested in side lines and equipment not used sufficiently to pay a profit. Trackage of this sort sometimes justifies its existence by serving to feed the main lines, enabling them to be operated at a profit. There are, it is safe to say, 50,000 miles of unprofitable road or stretches which do not even pay interest, not to speak of dividends. In fact, the 1909 deficits of weak companies amounted to $20,000,000.

Through the Railed Roads, the greatest artery of the fiscal circulation sustaining commerce, a large part of the money that passes from hand to hand each year is given an impetus so strong that its influence can hardly be calculated. Without their expenditures a hundred industries would lose directly, and all indirectly.

GREAT RAILWAY CUT, CRAWFORD NOTCH N. H.

A MODERN TICKET OFFICE.

Spending for Upkeep of Property.

A Good Example.

The importance of sufficient diversion of money for the maintenance of the great agent of our progress and prosperity is well exemplified by the history of a well-known road. This afforded an excellent example of a type of management then in vogue, which thought it more important to pay dividends than to keep its property in good condition.

A number of years ago the stock of this road sold at about $240 a share. Then the public suddenly became apprised of the fact that the company had been laggard in its maintenance, that its track was little better than two streaks of rust, and its equipment sorely behind the times. It cost approximately $130,000,000, $38,000 a mile, to rehabilitate it. As a result the stock dropped until it touched $14, only six cents on the dollar of its previous price.

EARLY HARLEM BRIDGE, N Y.

The New Vitality.

But the road assessed its stockholders and injected new money, and regained its youth through reconstruction and modernizing. It again assumed a place as an important public utility, and property values along its lines inereased greatly. The stock rose until today it sells above par.

This case is cited to show how important it is for a road to keep its property in the best of shape, as even temporary lack of care results in deterioration as dangerous as it is costly. Yet to many roads the proper maintenance means expenditures larger than can be afforded.

Freight Car Upkeep.

A run-down, weak or out-of-repair car, is a danger. Breakage of any important part of it might wreck a whole train, causing thousands or hundreds of thousands of dollars' worth of damage and blocking the traffic of an entire road. The car must, consequently, be kept in the best of repair all the time, in which case it may last for 18 to 20 years. The 1908 expenditures for repairs and renewals of freight cars aggregated $131,000,000, which is $436,000 per business day.

The Care Required.

A freight car should be painted once every two years. The wheels, each of which on a modern car weighs 715 pounds, and the axles, should be renewed every 100,000 miles. Couplings and draft

HARLEM RAILWAY BRIDGE, 1910

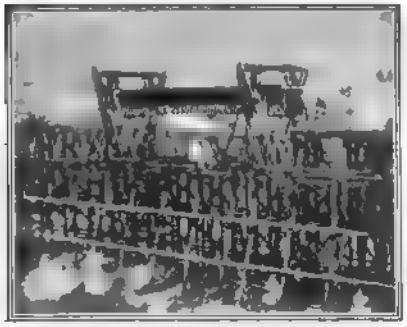
gear require constant repair and renewals on account of heavy smashing, and the air brake mechanism calls for the closest attention. Brake shoes wear out every few months. Sills rot and roofs spring leaks which may cause serious damage to the freight. Careless loading and shifting of heavy freight often result in much damage to the floor, ends and sides of the car.

Regiments of carpenters, machinists, mechanics and blacksmiths are the physicians and nurses who wait constantly on these patients in the great shops used as car hospitals. The Pennsylvania sends 12,000 cars a day to the repair shops.

Passenger Car Maintenance.

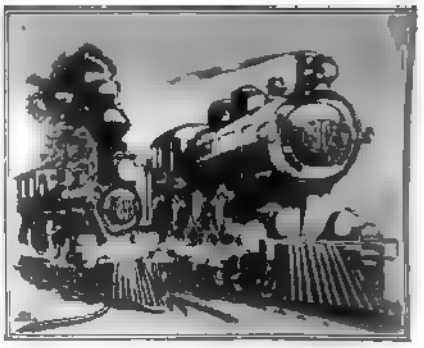
The money which each passenger car requires for its upkeep is more than each freight car requires, just as the maintenance of an automobile is more costly than that of a lumber wagon. The Rail Roads spend on the repairing of their 55,000 passenger cars and in renewals, approximately $30,000,000, or $100,000 a business day to keep your Rail Way carriages in good condition.

Upholstering, fine varnish, painting, carpets, ornamental metal work, wood and metal polishing, the repair of gas apparatus and steam pipes, the paraphernalia of dining cars, and linen are among the items to be looked after in keeping the cars in attractive condition for passenger traffic.



REBUILDING TRESTLE BRIDGE, SO. CAL. RY.

GROWTH OF THE LOCOMOTIVE, 1885-1908.



The yearly expenditures on locomotives reach impressive sums. Repairs and renewals on the 58,000 in use cost $126,000,000. The records for some other years surpass this total, 1908 being notoriously a year of general retrenchment.

Renewal.

The maintenance of all equipment required an outlay of $364,000,000 in 1908, or a million dollars every day. Yet engines, cars, coaches and machinery are constantly going to the bone yard, or scrap heap, worn out and useless.

The $4,000,000,000 worth of steel-made products wears out rapidly. England puts ribbons on her ancient locomotives and pays as much attention to them as to pet blooded cows. We "scrap" them. To-day's giant is to-morrow's "back number." You have heard of the New York Central's "999" that used to draw the fa-

mous "Empire State Express?" Several years later she was found humbly hauling a milk train in northern New York.

Road Beds.

The expense of keeping up the road bed is heaviest when it is new. It is then loose and the jar occasioned by every passing train weakens it. After a few years the ballast settles, the ties adjust themselves to place, the inequalities of surface are leveled, and finally track and bed become reasonably firm.

The road bed, however, never remains perfect, and has to be watched and gone over daily. The expenditures by the Rail Roads for repairs to roadways in 1908 reached a total of $210,000,000, almost as much as Great Britain spends on her army and navy.

Freight Better.

The wear and tear from freight traffic is less than from passenger traffic. The rush and jar of the passenger train has a scattering, wearing effect. The slower, evener, longer continued pressure of the freight train packs the bed into better condition; heavy, wide-tire trucking does the same on wagon roads.

The constant leveling, tamping, raking and cleaning of the road bed, the replacing of ballast, the renewal of ties, rails, spikes, fish plates, frogs, switch points, cattle guards, signs, fencing, repairs of road crossings, buildings, telegraph and telephone systems, bridges, docks and wharves, constitute an unknown expenditure of large proportions. Few of us realize that change of weather has an effect on Rail Way track, and that after heavy rain, freezes and thaws, the track requires again to be gone over and leveled.

Third of Billion.

One may recite the fact that included in the $319,000,000 spent in 1908 for maintenance of way and structures was $6,200,000 merely for crossings, fences, cattle guards and signs, $25,000,000 for bridge repairs and renewals, and $3,000,000 for repairs and renewals of telegraph lines.

Details of the Maintenance of Rail Roads.

How complicated the subject of track is, the layman can gather from a perusal of the long list of work and paraphernalia connected with it, as contained in a recent two-volume publication of 1,200 pages, almost entirely on the subject of track and its appurtenances. The items, all of which have to be considered, and whose installation and upkeep cost large amounts of money, are:

Earth work and grading.
Handling filling material and ballast, including steam shovel work.
Ditches and drainage.
Culverts.
Rails.
Joint splices.
Ties.
Tie preservation.
Tie plates. Tie plate laying.
Metal and concrete ties.
Section houses.
Boarding trains.
Work train service.
Wrecking.
Snow ploughs—snow sheds.
Fighting snow.
Fences.
Cattle guards.
Snow fences.
Bridge floors.
Bridge end construction.

Ballast.
Ballasting new track.
Track laying.
Track-laying machines.
Laying out curves.
Curve elevation.
Easement of curves.
Switches and frogs.
Switch stands and lamps.
Derailing switches.
Side tracks.
Crossings.
Slip switches.
Yards and terminals.
Interlocking switches and signals.
Distant signals for switches.
Automatic block signals and track circuits.
Surfacing and lining track.
Track shouldering and spreader car work.
Double track construction.
Track tools.
Tool houses.
Bumping posts.
Sign boards.
Slides and washouts.
Effects of bad locomotive counterbalance.
Rerolling and trimming rails.
Track elevation.
Track depression.
Track tanks.
Ash pits.
Track in tunnels.
Track deflection.
Rail Way gates.

OTHER GENERAL TRACK WORK.

Renewing ties.
Creeping rails.
Renewing, relaying and handling rails.

MAINTENANCE OF WAY ORGANIZATION.

Track officials.
Track foremen and laborers.
Track inspection.
Tree planting.
Change of gauge.

Many Costly Attachments.

To appreciate what the upkeep of track means, let the reader consider that there are 340,000 miles of it—75 pounds to yard—in the United States, representing an outlay of $1,000,000,000; that 2,600 ties per mile and 2,000 cubic yards of ballast per mile are required to give it a footing, and that the ties and rails in the main track must be replaced every eight years; ties sometimes are removed after three and a half years.

Steel Rails.

The business interests of this country received $60,000,000 in 1908 for renewals of rails and ties alone. The 1910 order of the Pennsylvania was for 200,000 tons—the world's record—costing about $6,000,000, largely to replace worn-out and deteriorated steel rails; enough to build a road from New York to Kansas City.

The rules of the maintenance of way department require daily inspection by track supervisors and engineers. At least yearly inspection by general and division officers is made.

Examination.

These yearly inspections are in most cases the source of a healthy rivalry, as a record is kept of the condition in which each foreman's section is found. Its smoothness is measured by a car with an indicator and delicate mechanism that records on a strip of paper the slightest inequality or imperfection. Prizes, which may be a sum of money, an increase in wages or a sign on the section tool house, or a combination of these, are given for the best section on each division.

Repairs and Maintenance of Buildings.

There is a startling variety and great number of buildings which the Rail Roads must construct and maintain. These build-

ings require as much care as any part of the Railed Road, and the outlay for this purpose in 1908 was $35,000,000. One's interest is challenged as to the vastness of the initial outlay upon these buildings if such large sums are required for upkeep. A list of the buildings belonging to a prominent Rail Road follows:

Passenger station.
Combination freight and passenger station.
Office buildings.
Freight house.
Shelter shed.
Water closet.
Express offices.
Club house—Y. M. C. A.
Baggage room.
Privy and coal room.
Coal and oil room.
Coal and oil house.
Canopies.
Milk platform.
Milk house.
Lamp house.
Telegraph office.
Stock yard.
Switch cabin.
Flag cabin.
Gate tower.
Dispatcher's office.
Supervisor's office.
Ice house.
Yardmaster's office.
Ferry house.
Lighter office.
Marine repair shop.
Transfer bridges.
Gas house.
Oil house.
Store house.
Commissary building.
Storage warehouse.
Pier shed.
Bulkhead shed.
Grain elevator.
Scale house.
Car house.
Coaling station.
Sand house.
Bunk house.
Green house.
Cement house.
Boat house.
Powder house.
Transfer sheds.
Emergency timber shed.
U. S. Customs office.
U. S. Customs warehouse.
Shelter house for steam cranes.
Coal trimmers' building.
Car inspectors' building.
Draw bridge cabin.
Flour house.
Sheep sheds.
Cattle sheds.
Snow sheds.
Ice trestle.
Dwelling.
Horse stable.
Shelter house for turntable motor.
Stencil cleaner's building.
Chalker's office.
Section tool house.
Water station.
Gardener's tool house.
Switchboard house.
Casting shed.
Battery house.
Cable tower.
Transformer house.
Power house.
Signal tower.
Signal repair house.
Water tank.
Electric light plant.
Air compressor's house.
Pavilion.
Bath house.
Paint shop.
Blacksmith's shop.
Engine house.
Carpenter shop.
Machine shop.
Car shop.
Boiler shop.
Erecting shop.
Steam hammer shop.
Iron shed.
Freight car repair shop.
Upholstering shop.
Lumber shed.
Paint storehouse.
Brass foundry.
Tin shop.
Air brake shop.
Waste storehouse.
Iron foundry.
Pattern shop.
Flue rattler house.
Potash vat.
Rest room.
Fire engine house.
Locker building.
Shelter house for ash-pit men.
Engine hostler's house.
Mail room.
Round houses, etc.

None Other So Costly.

This list is as impo[illegible] it is [illegible] rkable. Well may it be doubted whether there is any business institution which requires buildings as numerous and varied as these, and which necessitate so large an outlay of money. Nor must it be forgotten that few of these buildings are complete without more or less elaborate equipment, costing important sums in the aggregate, the wear and tear on which aggregate large additional amounts.

Coal bunkers, docks and freight cars whose loads, consisting of the heaviest material, are shot on or into them, often sustain great injuries. Floors and platforms are worn by the wheels of heavy trucks. The sheds that protect the mountain lines from snow slides require a large outlay for maintenance.

Malice and Carelessness.

A very important cause of the rapid deterioration is the generally careless public. Partial or entire destruction by fire also is not infrequent. Merely the replacing of property destroyed by the thoughtless whittler, the malicious "copper," and the fire-building, tomato-can-boiling hobo adds a considerable sum to the structural upkeep.

Dollar for Dollar.

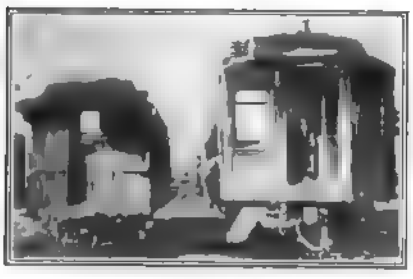
We have evidence that from the earnings of the Rail Roads such large sums have been put back into the properties that this return is equal, dollar for dollar, to the average capital stock. The statistics of the Interstate Commerce Commission show that $697,000,000—over two-thirds of a billion dollars—were spent by our Rail Ways in 1908, out of their receipts, for the maintenance of their plants and for permanent improvements.

Eleven years of such expenditure from earnings would more than suffice to duplicate every dollar of capital stock of the Rail Roads of the United States.

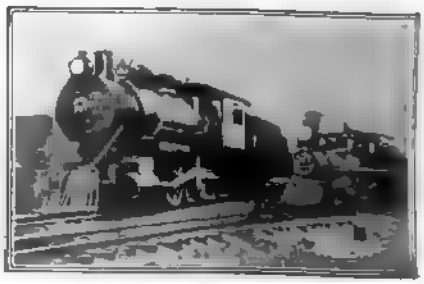
Spending for Reconstruction and Improvement.

A Voracious Maw.

Among the many items of unrealized expense attendant on Rail Road maintenance and operation is the outlay of $400,000,000 a year for the purpose of modernizing our Rail Roads, by improving and adding to the equipment, buildings, lines and machinery.



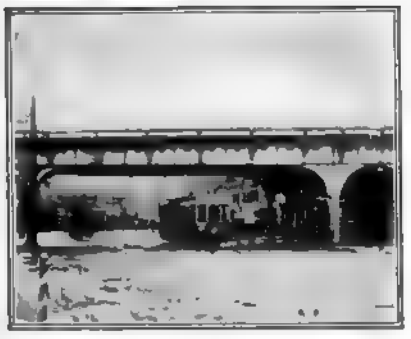
GROWTH IN DIMENSIONS OF PASSENGER CARS, 1880-1905



GROWTH OF ENGINES, 1907-1892.

Weight	195,000	40,000
Cost	$15,750	$5,000

BROAD STREET, NEWARK, BEFORE TRACK ELEVATION.



BROAD STREET, NEWARK, AFTER TRACK ELEVATION.

The New York Central lines in 10 years have spent $300,000,000. In a recent year they spent $30,000,000 for cars and locomotives, $12,000,000 for ties and rails, and $30,000,000 in track improvements. Yet the "N. Y. C." is not the biggest spender.

To criticise the Steam Roads for spending this money is like blaming a man for feeding himself, nourishing and strengthening his body and muscles, and improving the circulation of his blood, when he has difficult tasks to perform, and when the work he has to do has increased in volume an average of over 1 per cent a month for ten years.

Constant Improvements. The increase in business necessitates constant improvements in the whole field of Rail Way machinery, looking to the acceleration of traffic, and cheapening its handling. For this purpose, engines of improved type and greater strength and cars of larger weight and capacity and of more durable material, are bought when the old equipment has to be replaced or supplemented.

Big Expenditures. In one year the lines under the direction of the late Mr. Harriman purchased 15,000 new freight cars, 300 locomotives and 200 passenger cars, and in 1909 the Pennsylvania ordered 8,000 freight cars for 1910, at a cost of $10,000,000. The steel passenger cars of this road weigh 118,500 pounds, as against 85,000 pounds of the vestibule wooden coach. In order to have their passenger and main line equipment of 2,000 cars entirely of steel, the Pennsylvania is making an expenditure totaling $33,000,000 for these new passenger cars alone, spending $16,500 apiece.

Increasing Stability. To increase the stability of the roads, heavier rails are laid, the road bed and bridges are strengthened or rebuilt, buildings of many kinds and tunnels are duplicated or in some cases enlarged, and advantage is taken of many new devices which will facilitate the operating machinery and make the physical parts more substantial.

Turntables must be increased in size and weight, and especially must repair shops and their machinery be enlarged and modernized, to keep in condition the increased equipment and heavier

parts required in connection with the operation of a better, larger and heavier Rail Road.

Laying Roads Anew.

When the traffic grows larger, practically the only way to handle it is by increasing the number, weight and size of trains, which, on lines of light construction, would work havoc with the tracks and road bed.

Engines and cars with long wheel bases cannot, with economy, round the sharp curves made for the short bases of the yesterday of Rail Roading.

Grades have to be cut down and hollows filled in, at an expense only to be compared with the first cost of the road. Sometimes new rights of way are purchased and parts of the road laid along entirely new and more economical lines for operating.

It seems unfortunate that the early roads were not originally built on such sites as now prove most advisable, for the right of way then cost much less than it does to-day, but they were probably built in accordance with the best ideas of their day.

THE THIRD AND SECOND HAVRE DE GRACE BRIDGE. HOW RAILWAY BRIDGES ARE OUTGROWN.

Changing Entire Divisions.

The Pennsylvania has rebuilt and relocated practically every mile of its lines west of Harrisburg, and much of that from Harrisburg to Philadelphia. The Union Pacific and many other roads are doing the same thing.

The Pennsylvania Rail Way has just built a new bridge across the Susquehanna at Havre de Grace, which is the third at this point within the writer's memory. The first one was of wood and became too light for the heavy loads it was called upon to sustain. It was replaced with one of steel, and this in turn was over-burdened with the still heavier loads of the modern caravan and an entirely new structure, even to the piers and foundations, had to be built.

The Baltimore & Ohio is now making changes in its Susquehanna bridge near the same point at great expense.

Spending 96 Per Cent of Capital.

One Eastern road has rebuilt 500 miles to reduce grades and eliminate curves. The Delaware, Lackawanna & Western is spending more than $25,000,000 or an amount only $1,000,000 less than the entire capital stock, in shortening, straightening

and reducing grades between New York and Scranton, Pa., 192 miles. This sum is as great as the entire cost of building the original lines, more than thrice as long.

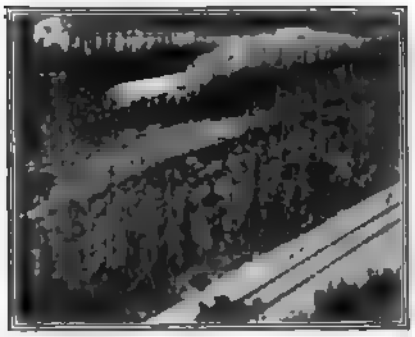
Extraneous Causes.

Some changes are made because of improvements with which the Rail Road has no connection. An interesting example is in the northern part of New York City, where the Marble-Hill cut-off on the New York Central was made possible by the construction of the Harlem River ship canal.

The cut-off effected a saving of three-quarters of a mile in distance, 102½ degrees in curvatures, and eliminated half a dozen street crossings at grade, all within what was originally a two-mile stretch. The great number of fast passenger trains using the line fully justified the great cost of the alteration.

Additions to Reduce Grades.

Increasing the length of a line is sometimes as economical as shortening it. Changes to reduce grade may greatly increase distance. An important reconstruction now under way in the Kicking Horse Valley on the Canadian Pacific Rail Way increases a present



FOUR LEVELS AND TUNNEL, CAN. PAC. RY.

DIGGING A RAILWAY TUNNEL UNDER 5TH AVE., N. Y

length of 4.1 miles to 8.2 miles, and adds many degrees to the curvature, but changes the existing grade of 4.4 per cent to 2.2 per cent, and will make it possible for two locomotives to draw 1,490 tons over a division where at present four locomotives are required to haul a train of only 710 tons.

Construction on the old line was easy, while the new line abounds with the heaviest kind of rock cutting, and requires three tunnels, two of them spiral in form and totaling well on to two miles, or 9,000 feet, in length.

Conservative Prodigality.

Lavish as these Rail Road expenditures seem, yet they are made with the utmost conservatism The improvements are permanent and the saving carefully reckoned before the work is undertaken. Many of them are charged to operating expenses, thus adding nothing to the road's capital account or fixed charges.

Stockholders who formerly protested against this method of

using earnings, realize that such improvements put the road in a position to meet competition, contingencies and future traffic requirements, so that the owners ultimately benefit.

The above serve as a few examples of many forms of expenditure by our public carriers that, by the average passenger and even by many persons living along the line, are unseen and unrealized.

AN IMMIGRANT TRAIN OF EARLY DAYS.

EXTRAORDINARY AND PUBLIC-SPIRITED EXPENDITURES.

The Unexpected.

Every business man, even the smallest, learns to allow for a certain percentage of extraordinary expenses outside of the regular channels of his business, which are unavoidable and unusual, just as every individual finds in going over his personal expenditures that he made unexpected outlays.

The business of transportation is no exception to the rule. It would even seem that this class of expenditures for the transportation industry assumes larger proportions than elsewhere.

Industrial Departments.

How They Help the Development of Resources.

Variety Life's Spice and Staff.

In the earlier days, practically the only industries upon which Rail Roads could depend for operation and revenue, were agriculture, stock raising and lumbering, and in the sparsely settled districts the shipment even of these products was often intermittent and of little importance.

It was recognized that to insure a greater variety of freight and thereby gain stability and continuity of earning power, a diversity of industry was essential. This led to the establishment of emigration departments, with the mission to people new territory as it was opened, or fill up partially developed regions; the varying inclinations, nationalities and surroundings of the immigrants were

expected to lead them to produce differing products. The industrial department sought out natural resources and encouraged their development, by directing the attention of investors to natural riches or particular advantages, seeking also to induce the establishment of manufacturing enterprises along the lines.

Co-operation and Publicity.

In many ways, enthusiasm was created or increased in communities where the citizens did not know or appreciate the possibilities of their section. The roads encouraged public subscriptions for development projects and sometimes themselves joined in financing new enterprises.

The business of modern land transportation, with its many special and extraordinary qualifications, has become a medium through which capital and labor, natural resources and opportunity, the emigrant and arable land, are brought together. Doubtless many of our 27,000,000 immigrants were influenced to come to America by the literature sent abroad by our transportation companies, and by their active agents, especially in the days of the settlement of the middle and north West. Our Rail Roads annually distribute millions of pieces of literature in foreign languages abroad

COKE OVENS LIMESTONE QUARRY, ALABAMA.

Opportunity.

In districts where coking coal, limestone and shale were found, the attention of cement manufacturing interests was directed to the opportunities existing.

In a certain section the experiment agents and agricultural chemists of a Rail Road's industrial department discovered that a high grade tobacco of a certain type could be grown successfully, and as a result the section now supplies a large part of the tobacco used for binders of Havana-filled cigars.

From sections of New Jersey and Arkansas where potato growing on a commercial scale was not thought of 10 years ago, hundreds of thousands of barrels are being shipped every season. In parts of Arkansas, around Fort Smith, the Rail Road development agents helped to determine that two crops could be grown on the same land a year.

Lunacy Was Horse Sense. Not more than 20 years ago James J. Hill gratuitously distributed blooded bulls among the cattle herds along the Great Northern Rail Way. People shook their heads pityingly, and bemoaned Mr. Hill's attack of lunacy. But when the Great Northern began to show handsome returns from the shipments of cattle, Mr. Hill's lunacy was admitted to be merely unusual horse sense.

The vast iron and copper deposits of Michigan and Northern Minnesota, the bituminous coal deposits of both East and West, and the great woodenware furniture and paper manufacturing industries in Michigan, Wisconsin and lately in the South, were products of the same species of enterprise, and capital was attracted, encouraged and often virtually created by the Rail Roads.

In rural districts where no other industry would thrive, canning factories have been established for the utilization of vegetables and fruits.

CHICAGO, MILWAUKEE & ST. PAUL FLYER.

Employment for 18,000. During 1906, along the 7,000 miles of the Chicago, Milwaukee & St. Paul Rail Road, through the efforts of the company, $20,000,000 was invested in new enterprises and additions to established industries, affording employment to a total of about 18,000 persons.

In a single year, 700 commercial enterprises were located on the Southern Rail Way by its industrial department.

Educating the Farmer. Much of the soil that is left on our farms to-day is merely skimmed milk, not the rich soil originally there. Our forefathers took the strength of the soil and neglected to feed it in return. Every sand drift, every worked-out or partially exhausted acre is a monument to the narrowness or prodigality of some farmer who, refusing to believe that anyone knew more about farming than his grandfather, did nothing to conserve the agricultural possibilities of his land by alternation of crops, or taking other steps which every progressive farmer now considers essential.

The work done by the Steam Roads in conserving natural resources and in spreading information relative to the improvement of farms, is doing much to restore and preserve our soil and is

immediately beneficial in showing how to make better and bigger crops, perhaps of a different character, but suited to the special conditions.

The College On Wheels.

The agricultural school on wheels introduced in the West, has been taken up by the Eastern roads. It is another step in the creation of traffic and extension of the farmer's prosperity.

State agricultural colleges supply lecturers and Rail Roads fit up the trains. Stops of 45 minutes usually are made. Farmers bring samples of their soil to be analyzed, or specimens of their vegetables, grains or fruits to be examined, and they are told how to improve the yield or grade, how to spray fruit and generally are made acquainted with the latest "wrinkles" in agriculture.

The interest taken by the farmer in these trips is such that more than 10,000 attended during a three days' trip of a farmers' special through Eastern Pennsylvania.

RICE SOWING AND IRRIGATION, CHINA.

The Rail Road as a Farmer.

Five years ago the president of the Long Island Rail Road established an experimental farm of 10 acres on supposedly waste and admittedly the poorest land on Long Island. In the summer of 1909, 300 kinds of fruit, plants and vegetables were grown on it. The astonished farmers of the neighborhood made haste to grasp their opportunities and truck farms have multiplied on the eastern end of Long Island, creating a freight traffic of important proportions.

Perhaps the best point in this story is that, although the farm established by the Rail Road president was an experimental one, with all the extra expense attached to the growing of so many varied products, it is, nevertheless, operated at a financial profit. Many Western roads likewise have experimental farms worked under the direction of their experts.

If Congress were only wise enough to establish experimental farms in every state, and the various sections of each state, as has been suggested by Mr. James J. Hill, it would do more to reduce the cost of living than almost anything else.

Business Acumen and Interests.

A Rail Road man waiting for a train decided to spend the hour before its arrival on the near-by river. He saw a number of vineyards on the bank and learned that the grapes were turned into wine and shipped over another road than his own.

Assuring a Market.

He agreed to find a market if the growers would try the experiment of selling the grapes in baskets instead of as wine. Though the commission men claimed that a single car load of the grapes would flood the market, the Rail Road agent had placards printed reading: "Take home a basket of white Niagara grapes for 15 cents." These he distributed at the market town.

The grapes were distributed among the retailers at 4 o'clock in the morning and five hours afterwards every basket was gone and more were demanded. This was the beginning of a grape traffic from that station which to-day amounts to a thousand car loads a season.

Pineapples in Florida.

To induce farmers to grow pineapples, the Florida East Coast Rail Way several years ago supplied the seed and agreed to build a side track into each farm that undertook the cultivation of the fruit. The shipment of pineapples over the Florida East Coast in a good season amounts to 1,100,000 crates.

The Steam Roads almost always endeavor to induce settlement along their lines, especially in the farming districts, where the produce of each new settler is reckoned to be worth eventually $500 to a Rail Road. The well-known "homeseekers' excursions" over many roads are made on a basis of a one-cent per mile passenger rate and frequently are crowded.

Peopling the West.

As a result of these policies and endeavors, many farmers in the East have sold their comparatively unfertile, though costly 40 or 45-acre farms in order to settle in the Western country on from 160 to 320 acres. This has been the means of producing wealth and relieving pinched conditions in many instances.

DRY-FARM WHEAT, IDAHO.

AN IRRIGATION STATION IN THE SOUTHWEST.

IRRIGATING WHEEL, CHINA.

Irrigation and Dry Farming. By irrigation in some districts and dry farming in others, what were many of the cattle ranges of the prairies, giving forth but little, have been made to produce abundant wealth. There are sections in the West, where it took 20 acres of land to furnish grazing for a single steer. To-day each acre produces substantially enough wheat annually to purchase a two-year-old steer. Grain elevators have been erected, flouring mills built and the conveniences and necessities of civilization established, all with the help of the Rail Roads.

Emergency Service.

A source of considerable expenditure is the service rendered by Rail Roads in times of public emergency.

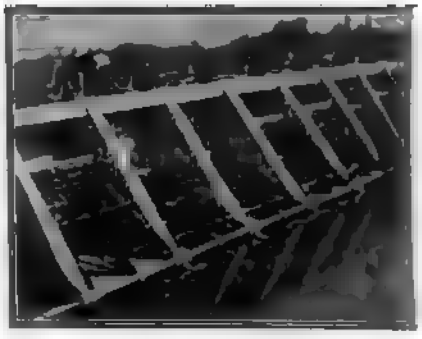
San Francisco. Immense amounts of relief supplies were carried free to San Francisco after the earthquake in 1906. These were "rush" shipments, calling for the most expensive kind of transportation—fast trains and clear tracks—implying the subordination of all other service to this end. One road -the Southern Pacific—carried 225,000 refugees from the city free.

Transcontinental lines carried large quantities of Chinese famine contributions free, and others at rates far below those usually charged.

In anticipation of winter fuel demands, nearly all Rail Road companies reduce rates on coal to induce communities along their lines to supply themselves before winter comes.

The Salton Sink Dam. One of the greatest public works of a Rail Road was the building of the great Salton Sea dam, to check the flow of the Colorado river into the "Salton Sea." This basin of rich possibilities under irrigation was already the home of 10,000 persons, whose homesteads had been or were in danger of becoming submerged, for the whole basin was rapidly becoming a lake. The Southern Pacific advanced more than $3,500,000 for the work of checking the overflow. How much of this it will recover is guess work.

MAT WORK FOR DAM, SALTON SEA.



HEAD GATE DAM, COLORADO RIVER.

In these and similar directions the Steam Roads have done true public service of much value.

Spending for Taxes.

The total internal revenue receipts of the Government, in other words, the taxes on tobacco, spirits, fermented liquors, oleomargarine, playing cards, and on miscellaneous matters, the only direct taxes received, were $289,728,114 in 1910. A single industry, the Rail Roads, put into the state, county and township treasuries of the nation, for the year 1910, a sum equal to 32 per cent of this; in round numbers, $93,000,000. This is $10,000,000 more than twice the total net ordinary receipts of the government in 1861.

What Their Taxes Equal.

Every fourth day the Rail Roads drop practically a million dollars into the tax tills. They pay school taxes just as others do, although they have no children to educate.

In fact, the Rail Roads pay the various state and local treasuries one dollar in taxes for every three dollars, and sometimes one for every two, given to the stockholder as profit.

High Cost of Living.

How the taxes on our Steam Roads have increased, both in toto and per mile, is an interesting illustration of the proportion in which expenses have grown. In 1889, when the Interstate Commerce Commission was established, the total paid by American Rail Roads in taxes, was $27,590,000, an average of $179 per mile.

For 1910 the total was $93,000,000, an average of $394 a mile of line; so that the amount of taxes paid had increased $65,410,000, or 236 per cent. This increase in taxes is evidence of the increased value of Steam Road property.

The Housecleaning of a Steam Road.

Every Day Cleaning Day.

The average housekeeper sets apart one day each week for housecleaning, but practically every Rail Road car on important lines, not only every day, but usually after each trip, gets as thorough a housecleaning as the most careful housewife gives her home on her special weekly cleaning day.

At least once a day it is taken to the yards, where not only the windows, but also the outside woodwork is washed. Wheels and running gear are wiped off and oiled. The car is swept out and the composition floors of modern cars are scrubbed and flushed out, in most cases with an antiseptic solution.

Dislodging Dust and Germs.

The cushion seats are taken out of the car, aired, whipped and beaten, so as to dislodge as much dust as possible. The backs of the seats and all interior parts of the car are usually gone over with pneumatic sweepers.

The toilets are cleaned carefully. The water cooler is filled and iced before the next trip, and the gas tanks are refilled when necessary; the carpet down the aisle of the car is taken up and pneumatically swept.

A single large road finds that the bill for this item, necessitating many women to clean the cars, amounts to over $200,000 a year. On the Steam Roads of the United States there are thousands of these "Rail Road Chambermaids."

Car Inspection.

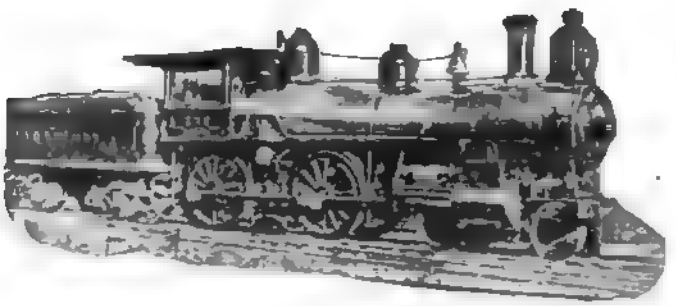
Each car has a rigid inspection of its running gear before it goes on the road, almost as thorough as the examination of different parts of the locomotive. The journal boxes have to be examined, and in some cases repacked. The gas, the steam heat, the plumbing, the lighting, all are gone over and the apparatus pertaining to each tested.

In fact, it is difficult to conceive anything more thorough, painstaking, or complete, than Rail Road housecleaning as performed in the United States, at a cost of millions a year.

532 Cleaners.

An instance of the nature of the work is furnished by the West Philadelphia yards of the Pennsylvania Rail Road, where an average of 1,500 passenger coaches are cleaned and inspected every day, with regard even to the smallest detail of their makeup. The car-cleaning department in this one yard numbers no less than 532 employes.

The average car receives a cleaning at least once a day, but if the car makes only short trips, as on suburban trains, it gets into the cleaner's hands three or four times daily.



A New England "Old Colony" Iron Horse, of the late '80's

Sixteen to One. Detergent cleaning is necessary to remove the thick layer of dust and dirt which often cakes on the exterior of a car; the term is derived from the soapy paste which alone is able to do this very difficult work. Sixteen men compose the gang which works on the outside of each car.

Meanwhile the inside cleaning goes on with no less vigor. The windows are washed and polished. The lights are gone over, metal polished, floor and woodwork cleaned, and movable parts are examined by a carpenter.

PART OF THE BALDWIN LOCOMOTIVE WORKS, EMPLOYING 10,000 HANDS

BEECH GROVE LOCOMOTIVE ERECTING SHOP.

SECTION XXXIV.

FEEDING, WATERING, DRIVING AND GROOMING THE IRON HORSE.

THE EVOLUTION OF STEAM ROAD EQUIPMENT.

The United States Government annually publishes hundreds of documents and uses tens of thousands of pages explaining how it spends $660,000,000. Since little has been done to explain how the Steam Roads, in the maintenance of a single department spend an equally large sum of money, the few pages that follow give the interesting details, as such a vast expenditure means much for our progress and prosperity.

The Horse.

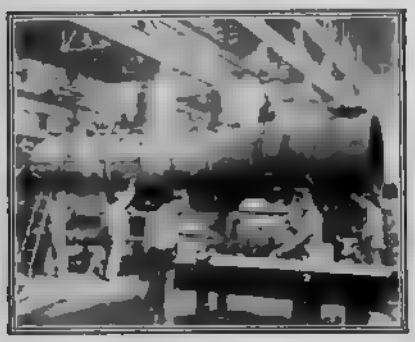
Many of us, especially those who have lived in the country, remember only too well coming home late on cold nights and having to stop at the barn, unhitch the horse, unharness him, take him to water, perhaps rub him down, feed him, blanket him, put the harness and robes away, and run the buggy into the shed, a task anything but pleasant or grateful

Our last thought as we lost consciousness was of this beast, and the annual often became a night "mare" Again, the first thing in the morning was to go out to the barn and rub him down and get his breakfast, even before we got our own.

The Liveryman.

If a liveryman were keeping our horse or we were hiring a horse from the liveryman, we would have none of these matters to inconvenience us. The Steam Road is our great long distance, rapid transit liveryman, and these offices have to be performed for the iron horse, the locomotive, only on a much greater and more costly scale.

Let us see what it costs to feed, water, groom and drive him and to keep him in good condition.



REPAIRING A LOCOMOTIVE

IN A LOCOMOTIVE SMOKE BOX

Feed for the Monster.

The Required Food.

Our iron horse must receive good food, and plenty of it, to give good work in return. This food may vary from soggy wood to mineral oil, representing the worst and best fuels in use. Between these two extremes an infinite variety of coals fills the list. The several fuels vary almost as much in food value as corn stalks and shelled corn or oat straw and oats in feeding the flesh and blood horse. The best yields three times as much energy and heat as the poorest.

The amount of fuel required will necessarily vary with the amount of work to be done, the skill with which the horse is fed, whether he is going up or down hill, and the condition of his internal organs.

Cost and Distance.

The cost varies with the distance from sources of supply the hard or soft coal mines or oil wells—more widely, perhaps, than the cost of grain and hay in various sections of the country. In fact, there is sometimes a material difference in distant parts of even the same state. Sometimes fuel has to be carried from the mine a thousand miles or more. It was formerly necessary and economical to supply some parts of the Pacific Rail Roads with coal from Australia, the freight costing several dollars per ton.

Even after the fuel has been delivered, it costs money to load it into the tenders, this cost varying from a few pennies to 50 cents a ton.

The Granary of the Iron Horse.

The plant for storing, handling and housing this fuel has the same uses as a haymow or barn and is no trifling item.

Banking Fires. While it is customary not to allow the fires to die down, when they do go out, fuel oil is used for relighting. It requires the services of a fire builder and 1,200 to 1,600 pounds of coal to warm up the locomotive. As it is common to hitch up the iron horse 10 to 20 minutes before the train departs, it can safely be reckoned that the steel steed will use approximately a ton of coal for his eye-opener, or morning cocktail.

DUMPING 50 TONS OF COAL.

THE OLD WAY OF LOADING COAL BY WHEELBARROW.

In cold weather, it takes about as much coal to keep an engine's fires up over night as to haul a hundred tons on a level road.

A Big Appetite. An engine with 2,000 tons behind it, running 10 miles an hour on level grade, will burn approximately 100 pounds per mile; at 20 miles, 170 pounds; at 25 miles, 200 to 250 pounds of coal per mile, three tons per hour. The amount of coal consumed, therefore increases in an almost proportionate ratio with the speed.

When on a grade of one-half per cent, a rise of only 26½ feet to the mile, a locomotive pulling a load of 1,000 tons 15 miles an hour burns 175 pounds of coal per mile. If we increase the grade a half per cent, to only 52 feet to the mile, the consumption of coal will amount to 425 pounds per mile.

Crookedness Costly. If the road has many curves, as is frequently the case on heavy grades, the power exerted must be increased to a surprisingly large extent. So great is this extra resistance that sometimes heavy trains are stalled on almost level parts of the road simply by encountering heavy curves.

It is as great a strain on an engine to haul 20 cars on a heavy grade or against sharp curves as to haul 80 cars on a level, straight road.

The length of the train also has a marked effect on the resistance which the engine must overcome and the consequent amount of fuel consumed.

The Iron and the Flesh and Blood Horse.

Muscle Inadequate.

If horses were still used to transport passengers no more than 240 miles could be covered in coaches in 24 hours, though figuring on 10 miles an hour, which is faster time than was made in carrying English mail, even with hourly relays..

Eighteen rigs would be used for the 72 people accommodated by a modern passenger coach. Each coach would need 48 horses for the 240 miles, two for each relay of 10 miles, but as each horse could be used for two periods daily, the 18 coaches would necessitate an average of 24 horses each, a total for the passengers in a filled car of 432.

Modern Coaching.

Confirming this estimate, Alfred Vanderbilt, recently shipped from America more than a hundred horses to work to his coach between London and Brighton, a distance of about 50 miles.

Of course, no breed of horses existing to-day could run unhampered, much less pull modern passenger coaches, at the speed of the iron horse.

Roughly estimated, to pull a single loaded freight car 20 miles a day would be good work for ten horses, as they would be moving some three tons each; figuring 240 miles a day, the average for each freight car would be 120 horses a day. A 50-car freight train would thus require some 6,000 horses to move it 240 miles in 24 hours.

Rooseveltian Energy.

A passenger engine, even deducting time for cleaning and overhauling, can work 18 hours a day. A passenger locomotive hauling a filled five-car train at an average of 40 miles an hour, seems, therefore, about equivalent in power, work and endurance to 6,330 horses.

What would it cost to drive these? How many men would it take to feed, hitch and unhitch them, and what would be the cost of the stables and stabling, including the wear and tear on the horse? At an average of only 50 cents a day per horse for all these items, it would cost $3,165 for the maintenance of the animal power necessary to equal that of a single iron horse. Then a very good road would have to be provided, the upkeep of which would be no small item.

A Hungry Stomach.

According to this deduction, on passenger service, the locomotives in the United States are equal to 400,000,000 horses. There are only 22,000,000 horses, young and old, in the country. Four hundred million horses at 50 cents a day for food, stabling, driving and grooming, would cost $73,000,000,000 a year, or almost twice the total annual products of our nation. Such a number of horses would be like a pest of locusts, devouring everything in the country.

It is a difficult thing to determine the actual horse power ex-

THE GREAT CAR WHEEL WORKS OF THE GRIFFIN WHEEL CO.

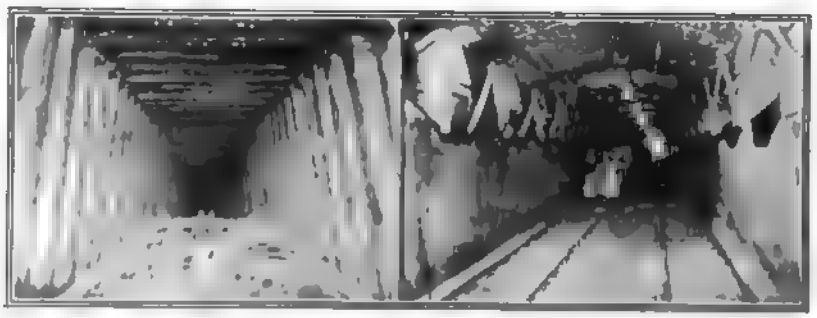
erted by a locomotive to pull a train, as there are so many variables, such as grades, curvatures, the condition of the axles and bearings, the atmospheric condition of heat or cold, wind or calm, humidity or dryness, but we do know that the horse power developed by a passenger locomotive varies from three hundred to twelve hundred. There may be periods and conditions, as on a descending grade, with the wind in its favor, when the locomotive may exert up to 2,000 horse power. But, even on the lower bases mentioned, on the average passenger train, with its 58 passengers, each passenger has the equivalent of five horses pulling him over low grades at low speeds, and as high as twenty or more horses moving him at the higher speeds over heavy grades and curves. The use of this horse power, with all attendant conveniences, is received by the passenger at a cost of one and nine-tenth cents.

The freight locomotive seldom has a train behind it equivalent to its total tonnage capacity, and while running at lower speeds, it may yet exert as great a horse power as the passenger engine. It is estimated that about 900 horse power represents the average of the freight locomotive. This 900 horse power is required to pull the average freight train load of 383 tons, under varying conditions.

A Rail Road train, like any vehicle, requires extra effort to start it, and during the period of acceleration, the demand upon the engine is much greater than when it is running at a fixed speed. This item is explained in our section "The Cost of Starting and Stopping a Train."

Weather. The atmosphere is an important factor in fuel consumption and efficiency, for when it is damp, foggy or rainy, an engine will not steam as well as in clear weather, requiring either a reduction of cars in the train or increase in fuel burned.

The absorption of heat in cold weather makes a marked difference in the amount of work the engine can do, and the difference in coal consumption between such months as July and December, is as 19 is to 25, an increase in the cold part of the year of over 30 per cent. It varies in ratio for the months between.



SLOPE IN COAL MINE. CHUTES FROM COAL MINE.
REPUBLIC, ALA.

Water for the Iron Horse.

Water is not usually regarded as an expensive item, but our iron horse is a thirsty animal, as we would be if we had a stove, or better described, a Vesuvius, actively at work in our stomachs.

Never-Ending Drought.

On the Southern Pacific for many years there was no water on a stretch of line for 119 miles east of Tucson, Arizona, and all the water for engines and that consumed by employes, had to be hauled to the points en route by locomotives.

Many of the stations and section houses in a vast region in the West still are as dependent upon such provisioning as a caravan on a desert is upon the water it takes along. Tank cars holding water are sent to them regularly, and when empty, are hauled back to the source of supply, and replaced with full ones.

A RAILWAY WATER SOFTENING PLANT

OVER THE TREELESS AND WATERLESS PLAINS.

Until a short time ago, much of the water had to be hauled by Rail Road as far east as Sedalia, Mo., for a large part of the year. Recently, at great expense, large storage reservoirs were erected in that vicinity to catch storm water and save this cost.

Costly Water.

A well-known American Rail Road some years back found that it could economically spend $18,000,000 to secure its own water supply for a part of its line. This expenditure, averaging $20,000 a mile for the route miles covered, was forthwith made. Without this supply during the drought of the Summers of 1908 and 1910, the road would have been unable to continue running the scheduled number of trains. At the same time there was a great saving, despite the large interest charge and pumping expense.

The company has purchased further, 75,000 acres of land to protect its water supply, and is preserving the forests and planting trees for further conservation.

The Proportion.

The locomotive must have about 12 gallons, or 100 pounds of water in round numbers, for every 16-pound shovelful of coal, so that it takes six times as many pounds of water as coal to operate a locomotive. A large engine, drawing a heavy train, and working at

full capacity, will consume from 4,000 to 5,000 gallons of water an hour.

When obtained from city water works, this costs, as a rule, from 7 to 15 cents a thousand gallons, and when pumped from streams or wells along the way, about 5½ cents.

A RAILWAY WATERING STATION, 1830.

Impurities in Water.

Nearly all water, no matter from what source, contains more or less solid matter. The locomotive is a connoisseur on water, and its boiler a still, for in passing the water through its system it leaves most of the solid matter therein.

Locomotive Constipation.

If the deposit be carbonate of lime, sulphate of lime, sulphate of magnesia, alkali, sulphate or salt, it forms a crust or scale upon both tubes and fire-box. This coating being a non-conductor of heat is a serious obstacle to economical operation, causing the engine to require an additional quantity of fuel to maintain its power.

You might imagine your own intestines coated with a layer of stone or cement, which would not permit your body to absorb the full strength and heat of the food you consumed.

Some waters are so highly mineralized that the deposit amounts to 200 pounds on a trip of say 200 miles. Other waters contain corrosives, such as acids and chloride of magnesium, which have a very deleterious effect upon the boilers.

Water Softening.

As a result, many Rail Roads, particularly in the West, treat their waters with neutralizing chemicals for the purpose of softening them by precipitating the solid matters and removing them before the water enters the boiler, the cost of which process runs from 5 to 21 cents per 1,000 gallons. As the softening plants cost from $5,000 to $50,000, this water cleaning and purifying is a serious item of expenditure.

The effects of bad water may be briefly summed up under the following heads:

Waste of fuel by blowing off water from the boiler in order to prevent settlement of deposits.

Fuel Waste. The waste of fuel by incrustation of the heating surface, which prevents the ready transmission of heat to the water, lessening an engine's efficiency up to 70 per cent.

The time and labor to wash out boilers frequently.

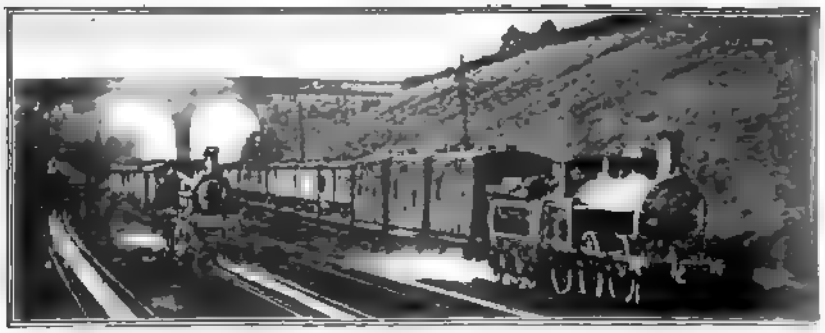
The time, labor and cost of frequent and elaborate repairs to boilers.

The detention of trains on the road, due to poor steaming and foaming, and possible accidents to tubes, fire-box, cylinders, pistons, valves, etc.

The Intestines. In some sections of the country, where there is very bad water, the intestines or flues of our iron horse have to be renewed every 90 days. This costs about $300, and puts the engine out of commission for several days.

It is estimated that under ordinary circumstances one-fifth of the efficiency of coal is lost owing to impurities in the water.

Including cleaning, the average cost of water being figured at 5½ cents per 1,000 gallons, the item of water consumption is brought to a cost of about $4.50 per trip.



Drinking on the Run. To save the time required to stop for water and regain the regular speed, and so as not to necessitate the hauling of extra tenders or water tanks, long shallow troughs filled with water, as much as 1,800 feet or a third of a mile long, are placed between the tracks on many of our important roads.

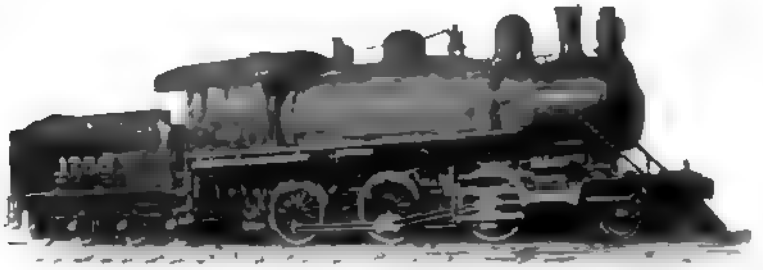
As a train passes, the fireman drops a hinged spout with scooped end into the trough. Through the momentum of the train, the water is picked up, rushed up the spout and into the tank of the tender.

Cost of Repairing and Overhauling the Iron Horse.

Liniments and Wiping. Our four-legged horse may get along without liniments, but the iron horse insists upon his. The cost of lubrication per 1,000 running miles varies from $1.31 for a light passenger engine to $2.68 for a heavy freight engine; the average is figured at $1.82. Under heavy work on some roads, lubricants cost even as high as $3.20 per 1,000 miles run.

The towels or waste used in wiping down the engine can only be used for a limited time. This item costs about 30 cents per 1,000 miles.

Incidentals, Tools, Etc. The cost of wear, loss and breakage of tools, lanterns, shovels, etc., is not inconsiderable, when multiplied by the thousands of engines for which they are required in daily and hourly service. The lighting and heating of trains is likewise a matter of no small expense, amounting to something like 20 cents for each car in a train per trip. To light a train by electricity takes about three horsepower per car. Heating takes 100 pounds of coal an hour for a good-sized passenger train.



A GOOD LOCOMOTIVE NO LONGER FASHIONABLE.

Overhauling. Our iron horses must be taken out of service and thoroughly overhauled when they have run from 80,000 to 100,000 miles. As a rule, freight engines must have new fire-boxes and more or less thorough overhauling every 100,000 miles, or about once every three years.

In some states laws have been passed requiring engines to be overhauled every six months. This, when heavy work is done, is not too frequent. Each one of these overhaulings would buy several teams of pretty good horses, as it costs from $750 to $1,500 each time, to which should be added from $500 to $1,000 when a new fire-box is put in.

Rebuilding. When locomotives are rebuilt, that is, receive new boilers and other important parts of machinery, the cost runs up to 30 or 40 per cent of the original cost of the engine, and in some cases to even more.

The general overhauling and wear and tear on an engine vary in cost from 3 to 10 cents per mile, independent of daily or running repairs, which are from about $1.20 to $2.83 per 125 miles. In some cases they may run to 10 or 15 cents per engine mile, where there are conditions of difficult service and great strain, as upon very heavy grades.

Helper Engines.

Frequently, if traffic be extra heavy in one direction, or on grades where helper engines are necessary, many engines return light or with loads consisting only of partly filled or empty cars. This adds materially to the average cost per mile of loaded trains, and must be reckoned in the cost of freighting, for the extra expense must be made up from the traffic.

Even with constant care and repairs, in 20 years a locomotive is so antiquated as to be of comparatively little value. If an engine be used to its full capacity, its efficiency will be seriously impaired in as little as 10 years. Of the 58,000 engines in the United States, 51,000 have been built in the last twelve years.

Driving the Iron Horse.

The Cost of Driving.

Few of us realize how large is the cost of driving the iron horse. The engineer is paid some 4.15 cents a mile for driving the passenger engine. Because it covers less space in the same time, the cost of driving the freight engine is greater per mile than that of the passenger locomotive, the engineer of the freight getting 4.85 cents a mile. The usual pay to the engineer is 40 to 48 cents an hour, even though the engine is standing still on a siding or if the train is out longer than its scheduled time. The average pay of the engineer is $4.50 a day.

Lengthy Delays.

The writer knows a single-tracked road, which is often seriously congested. The passenger and perishable freight trains have the right of way and must be moved on, but near a certain division point the freights have been known to be detained for as long as 76 hours before a clear track into the terminal can be found.

Up to the time that the 16-hour law compelled relief of all crews after they had been aboard that period, both engineer and train crew made about 10 days' pay during such a not unwelcome delay. Of course, they were compelled to stay on duty meanwhile, though safely at anchor on a siding.

Delays of even longer duration are of frequent occurrence in case of wrecks, landslides, snow blockades, bridges or trestles carried away, storms, floods, etc.

Sometimes Short Hours.

On many roads the engineer will run a train out from the starting point to the end of the division, a trip of perhaps 125 miles, doubling back almost immediately for the same distance. Probably seven or eight hours are taken for the round trip, but for this the engineer, and, in fact, all the crew, receive the equivalent of two days' pay. In such a case they usually lay off the next day.

The fireman gets usually $2.50 per 100 miles on passenger trains, and $3.00 on freights.

21 Cents a Minute.

The train crew, consisting of the conductor, baggageman and trainmen, receive approximately 7½ cents per mile. It therefore costs about 14 cents per mile to man and run a freight train. On a passenger train, such as the "Twentieth Century," the crew gets up to 21 cents a minute wages, or twelve dollars an hour.

Grooming the Iron Steed.

The Hostler.

It is the rule in this country for the engineman to leave his locomotive on a designated track, where the "hostler," or engine dispatcher, takes charge of it. This appellation of the man who takes care of the iron horse is one more evidence that that term is no misnomer.

The Hostler's Duties.

The hostler takes the iron horse to the coal trestle for a fresh supply of coal, to the water tank to fill up the tender, to the ashpit to have the fire cleaned out, and to the sand house for a fresh supply of sand. The cost of hostling varies from 39 to 80 cents; it may safely be averaged at 50 cents for each trip.

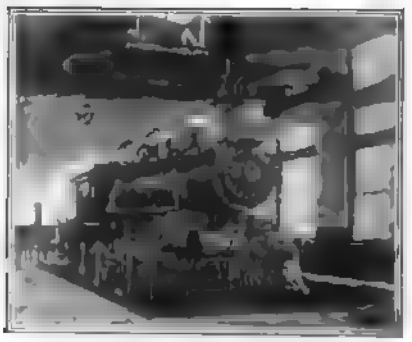
Before an engine goes into the round house it has to be turned around, and the cost of doing this varies according to whether it is turned by electric, steam or hand power, and the number of engines handled per day. It is an item of no inconsiderable dimensions, but it is so difficult to determine exactly that no estimate will be ventured.

Cleaning Fires.

The cleaning of fire-boxes previously mentioned, is most essential to economical operation. The iron horse requires his dose of physic and his stomach is sometimes completely emptied at the end of a run; clinkers are always removed from the fire, and the grate bars are cleaned.

The Knocker.

Ordinarily, this is done by the hostler, but when the impurities have accumulated to any extent a "fire-knocker" is employed. The item costs about 15 cents.



TESTING PLANT, ALTOONA.

LIFTING A LOCOMOTIVE.

When the engine is in the round house, it has to be wiped or curried, meaning an expenditure of from 50 cents to $1.

Inspecting the Steam Horse.

Locomotives' Veterinaries.

No stable of racing horses is more carefully looked over than the iron horse of the modern Rail Way. The "veterinary," the boiler inspector, comes and looks it over to see that its stomach and bowels are in good condition. The motive power inspector, who is like the trainer of a racing stable, looks over its legs, the wheels and pistons, and the machinery, to see that they are in first class order. Sometimes a general inspection is also made, so that the engine will have three inspections while in the round house.

DEWITT CLINTON AND THE TRAIN NAMED AFTER HIM

In addition, the engineer is supposed minutely to examine every part of the machine before it is taken out upon the road. Of course, these inspections entail the outlay of considerable sums.

The Call Boy.

The call boy of the theatre has his duplicate on the Rail Road. Engineers and train crews are supposed to live within a mile of the round house, and a call boy goes around to call each crew in time for them to go out. A further disbursal!

It is safe to say that the cost of grooming our iron horse, whether he be in the round house a short or a long time, with the cost of firing up, varying according to the price of fuel and size of engine, runs from $3.50 to $8.00 per trip.

Millions for Maintenance.

During the year 1908, a period of general depression and curtailment, enginemen alone received a total of $86,000,000; firemen received no less than $51,500,000. Fuel cost the Rail Road $201,500,000; crews received $152,000,000, and locomotive renewals and repairs,

including estimated depreciation, amounted to the tidy sum of $138,000,000. As is obvious, this list leaves out many of the things mentioned above as essential to the operation of the locomotive, yet here is a total of $629,000,000, or almost $1,750,000 every day. The feed, water driving, grooming of an Iron Horse cost $11,000 a year.

Great were the dinosaurs and like prehistoric animals; great must have been the power of the mastodons; yet even their strength would be but that of a beetle compared with a powerful iron horse The mightiest of them, when pitted against the modern iron horse, would be as a babe against a trained athlete.

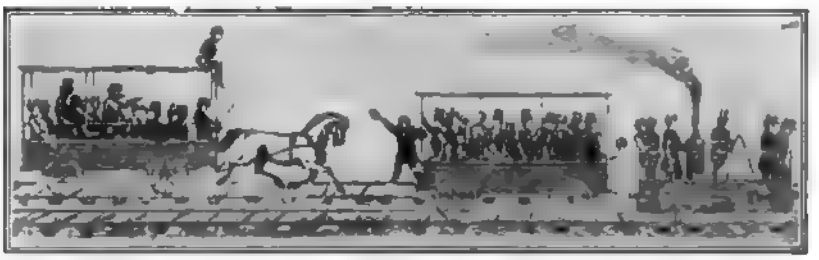
The Servant Hercules.

In the locomotive, the great mobile creature, man has built a commercial equine Frankenstein, who, though of gigantic stature and power, is yet obedient to his will, subservient to his wishes and does his land work with greater speed and greater economy and has greater power than any other of his helpful agencies.

THE IMPROVEMENT OF THE BREED AND THE GROWTH OF THE IRON HORSE.

The New and the Old.

The progress in engine building and development is food for a most fascinating story. The early engines in the United States, great as they were in contemporaneous eyes, compared with those of the present day, crawled along feebly, slowly and laboriously, as children on hands and knees who have not yet learned to walk.



THE FAMOUS RACE BETWEEN THE IRON HORSE AND THE GRAY HORSE.

As late as 1832 was the famous test between the fraction more than one-horse-power locomotive of Peter Cooper on the wooden rails of the Baltimore & Ohio and "the gray horse." History is hazy as to the winner. It is said, however, that owing to the slipping of the belt on the blower of the engine, its power went down and the horse won.

At the opening of the Stockton & Darlington Rail Road in England the trains were immediately preceded by a man on horseback to clear the track.

Moving Uphill.

The tractive power, meaning the adhesive or rail gripping power, of the locomotive was so underrated, that where serious acclivities were encountered, inclines operated by stationary power were introduced. The

Mohawk & Hudson Rail Road, now part of the New York Central, had inclined planes in use at Albany until 1884, and its trains thus scaled the hills that barred the way to Schenectady.

Dr. Johnson's Error.

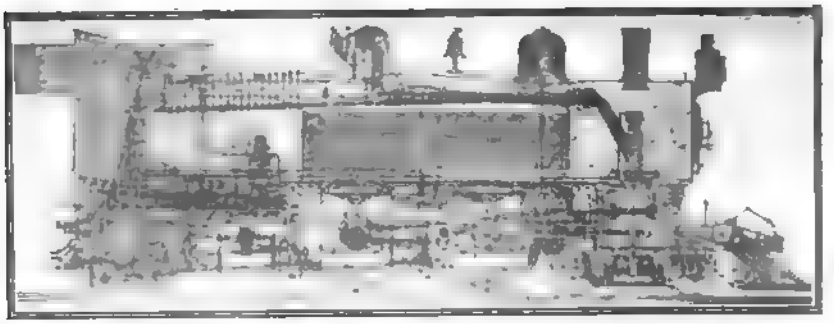
Dr. Samuel Johnson is reported to have said that people never would be able to ride 15 miles an hour, as even if vehicles could go that fast, it would be impossible to breathe at so high a speed. Sceptics said that locomotives would so scare the cows that they would cease to give milk.

As a matter of fact, it is practically as easy to breathe on a train going 70 miles an hour as on a train traveling at less speed.

One of the great features of the modern locomotive not possessed by the old one, is its steam-making capacity. The reason the old Peter Cooper engine was given such a close race by the horse, was because it could not make steam enough to supply the engine. In the "Tom Thumb" of Peter Cooper, gun barrels were utilized to serve as tubes, as the best thing available in tubing. The boiler was hardly a tea kettle compared with those of the modern locomotives. In fact, up to that time, power was produced in the tea-kettle way; that is, the flames were applied to the bottom of the boiler, instead of having the tubes carry fire through the water.

Fire Ways.

The heating surface of the fire-box or furnace of a locomotive may be considered insignificant as compared with the heating surface of its many tubes. As we show in the accompanying illustration, these are much like



SECTIONAL VIEW OF A LOCOMOTIVE

our intestines, in the one case the water gets the heat and in the other the body gets the nourishment. The tubes are from 100 to as high as 400 in number, and have a heating area of as many as 4,000 square feet in the large passenger engines, and over 6,300 square feet in large Mallet compounds for freight service. In 1880 a large passenger engine had about one-fifth as much, or 1,200 square feet of heating surface.

An Acre of Fire Surface.

The modern Mallet, therefore, has a heating surface almost as large as three city lots. Seven of such engines represent a heating surface of an acre. If you can imagine a space as large as this, with the flames of the most intense fire constantly licking it, you can ap-

preciate what an extreme of heat, steam and power is created inside of the iron horse, necessary to pull you along on your journey.

Weighty Matters.

The early engine weighed from three to six tons, yet it was too heavy for the existing track. It had wooden wheels and in some cases a wooden frame. The modern engines weigh from 150,000 to 350,000 pounds. The most modern of our freight engines weigh, including the tender, 750,000 pounds.

Our engines, therefore, weigh from 25 to more than 100 times as much as the old ones.

The driving wheels of some of the earliest engines were 36 to 40 inches in diameter; Old Ironsides had 54-inch wheels. Wheels of the modern passenger engines are sometimes as high as 84 inches. The modern engine covers 18 to 23 feet in a single revolution of its wheels, while the old one traveled about 10 feet, only half as much.

Mechanical Improvement.

That the appearance of the locomotive has lately undergone a change has probably struck the eye of even the uninitiated, for many of our modern engines are being equipped with Walschaert valve and reversing gear, which consists of a series of arms, rods, etc., outside of the driving rods of the engine.

This mechanism, or, rather, the equivalent of what is now in use, was formerly under the engine and between the wheels, and so limited in length as to be less efficient than it might have been. It is now being returned to the position where Walschaert put it in 1844. This is perhaps the only return to a detail of early locomotive construction.

Saving Hot Air.

The "compound" engine, another modern improvement, uses the same steam twice. Instead of the old-fashioned slide valve, the cylindrical valve is now in use in some cases. When we come to the freight engine, the cart and workhorse of the Rail Road, we find that its development and progress have not fallen behind those of its speedier, aristocratic brother.

The Mallet Compound.

The big Mallet compound engine is practically two gigantic locomotives with a single boiler, or a tandem team of engines under one boiler. These engines weigh as much as 430,000 pounds; the diameter of their cylinders is as large as that of a flour barrel for the high pressure and of a hogshead for the low-pressure cylinders, and there are four of them, which are filled twice at every revolution. They, therefore, use eight barrels of steam at every revolution. Their driving wheels are 48 inches in diameter and at 30 miles an hour turn 225 times a minute.

Looking Backward.

One of the most primitive of locomotives was a car driven by a horse mounted on a treadmill, connected with the wheels of the car. Some of the first smoke stacks were so high that they had to be lowered by means of hinges when passing under bridges.

Frequent Fires.

When wooden covered bridges were still in use, a watchman carrying a bucket of water followed every train as it crossed over a bridge, to extinguish the fires which might be caused by the large sparks from the wood fuel. The spark-arresting device was not invented for many years.

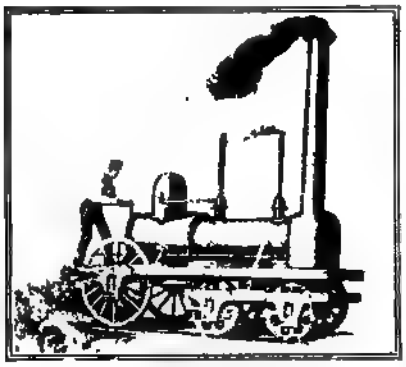
Of Baldwin's first practical locomotive, it was said at the time, "there is every reason to believe that this engine will draw 30 tons gross."

Speed Limits.

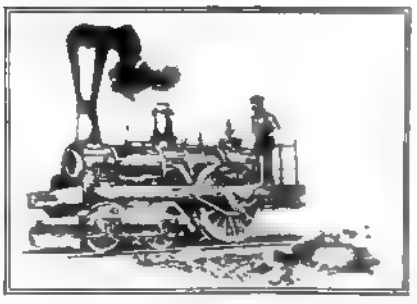
By 1840, so rapid had been the progress in capacity, speed, and size, a train with a gross weight of 423 tons of 2,240 pounds, exclusive of the 11-ton engine, made the trip from Reading to the foot of the inclined plane on the Columbia Rail Road, 54½ miles, at a rate of 9.82 miles an hour. This performance was considered unapproachable.

In 1846 two 25-ton engines, the giants of their day, were built by Baldwin. By 1850 many locomotives weighed up to 25 tons.

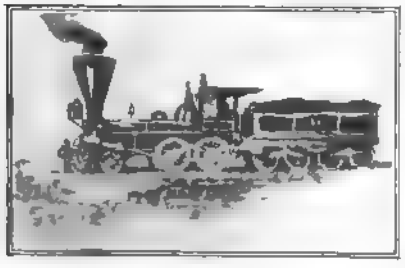
Among the other notable achievements of that year was the building of the Lightning, by Norris, which ran 60 miles an hour on the Utica & Schenectady. But the engine was unable to stand the strain of such work, and, therefore, remained in working order only a short time. In the same year an engine built by Winans ran on the Boston & Albany at a mile a minute, and drew seven cars



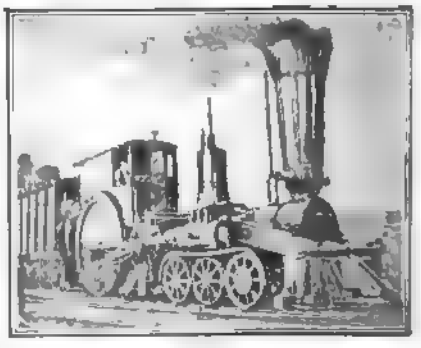
JERVIS' 'EXPERIMENT,' 1832



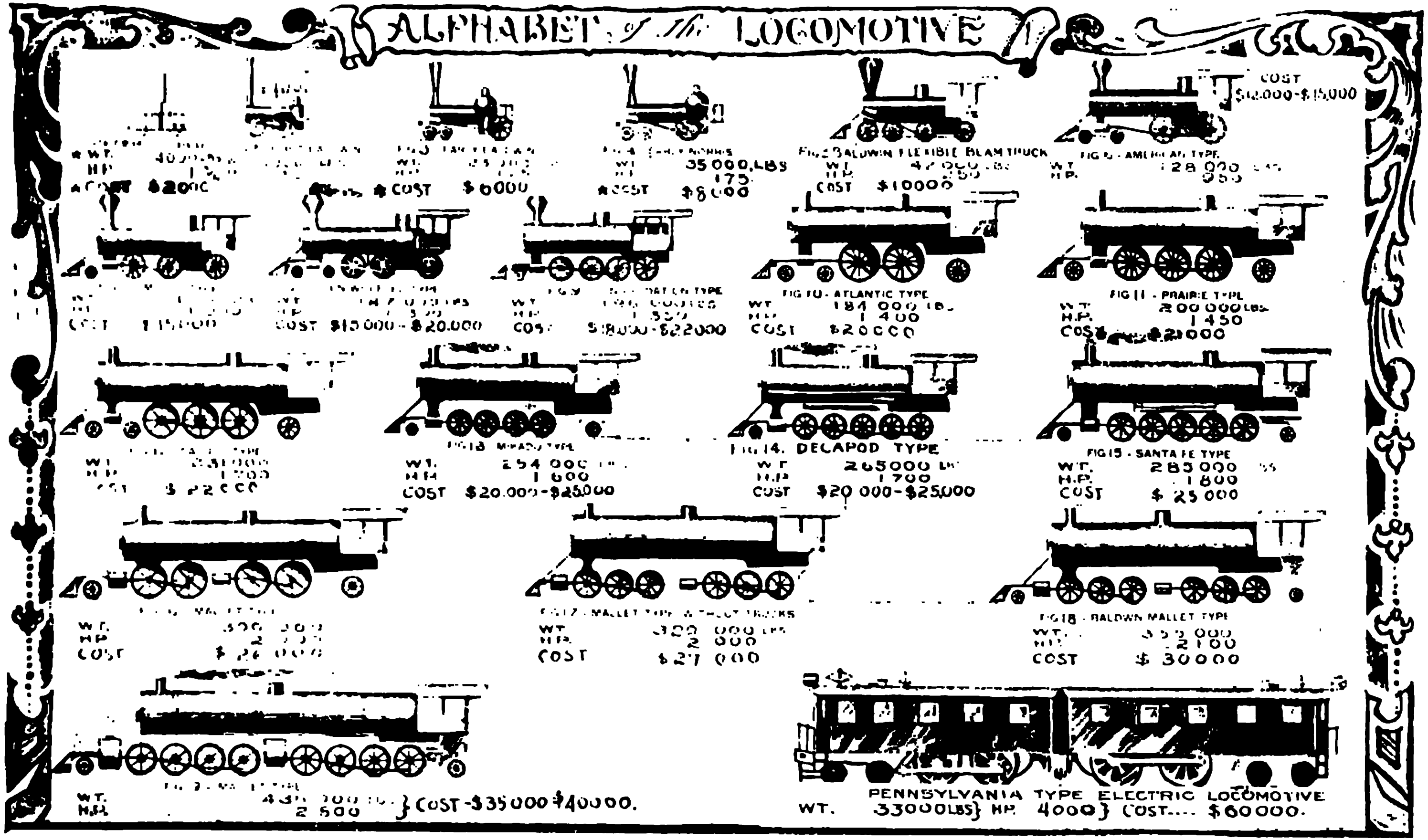
ROGERS' "SANDUSKY."



NORRIS' 'PHILIP THOMAS, 1838

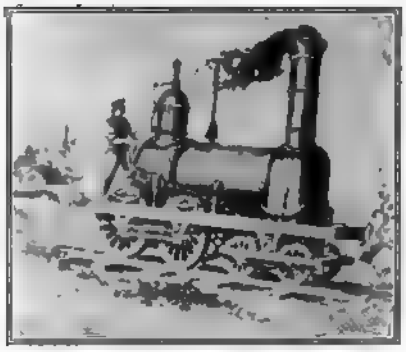


THE STEVENS-CHAMPION ENGINE WITH BIG STACK.

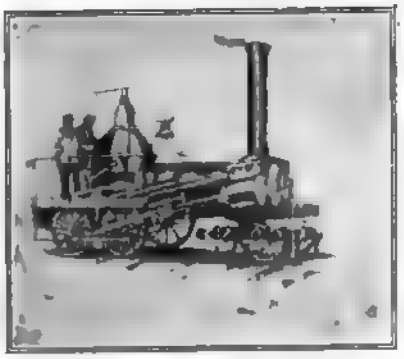


* ESTIMATED

THE GROWTH OF THE LOCOMOTIVE FROM THE SIZE OF A HANDCAR, FROM 2 TO 215 TONS, FROM 1¾ TO 40,000 HORSEPOWER, FROM $2,000 TO $60,000 IN COST.



THE "CAMPBELL," 1836.



THE "HERCULES," 1837.

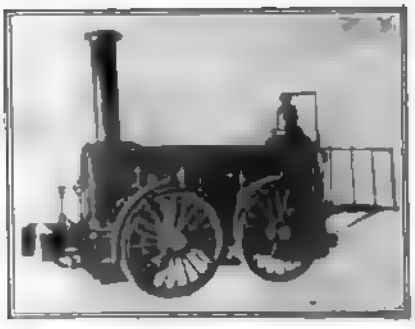
Hauling Power. A Baldwin freight engine weighing 18 tons, drew 150 loaded cars, weighing a total of 1,130 tons, from Schuylkill Haven to Philadelphia on a favorable grade at seven miles an hour in 1850. Recent tests on the Pennsylvania Rail Road, near this region, showed that modern engines are capable of hauling 7,000 to 8,000 tons, while an engine on the Virginian Rail Road hauled a load of over 9,000 tons.

In 1856 the substitution of coal for wood attracted much attention. About 9,000 wood-burning locomotives were then in use.

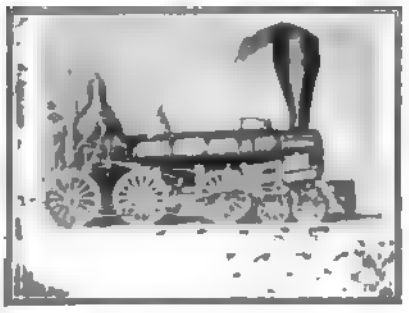
Fuel Selection. Tests of bituminous coal proved that a ton of it furnished as much available heat as 1^3_4 cords of average wood, and the coal had the further advantage of being cheaper than the wood in many places. On the other hand, the repair bill on a coal-burning locomotive was higher.

The Webster, introduced in the early sixties by S. M. Felton, president of the Philadelphia, Wilmington & Baltimore, was the first entirely successful coal burner. Its operation was 50 per cent cheaper than a wood burner of the same capacity. It also did away with the practice of frequent stops for a new supply of wood.

An important advance, one tending to considerable reductions in the cost of maintenance, was "standardizing." This provides that the parts of all locomotives of a given class be interchangeable, some parts being applicable also to all engines of whatever class



[illegible] 1838.



NORRIS & CHESAPEAKE, 1846

THE "PIONEER." 1851. CUMBERLAND VALLEY RAILWAY.

LOCOMOTIVE, 1863. IRON VALLEY RAILWAY OF VIRGINIA.

As a result, the duplicate parts on hand at the various shops suit whatever engine requires them.

Modern Fast Trains.

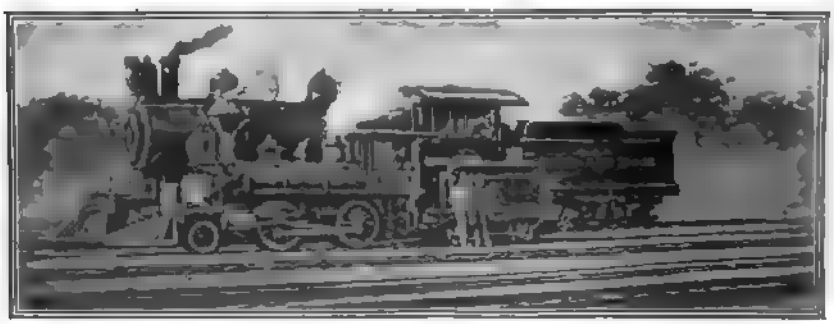
Go-as-Please Methods.

In the early days of Rail Roading, passenger and freight traffic were combined, and mixed trains were the rule almost universally. These trains had only approximate schedules, sometimes being hours late, according to the amount of freight they had to take on and put off at the various stations. The rivalry between the competing lines and the increased demands for rail transportation caused the abandonment of "mixing," and resulted in a gradual increase in speed.

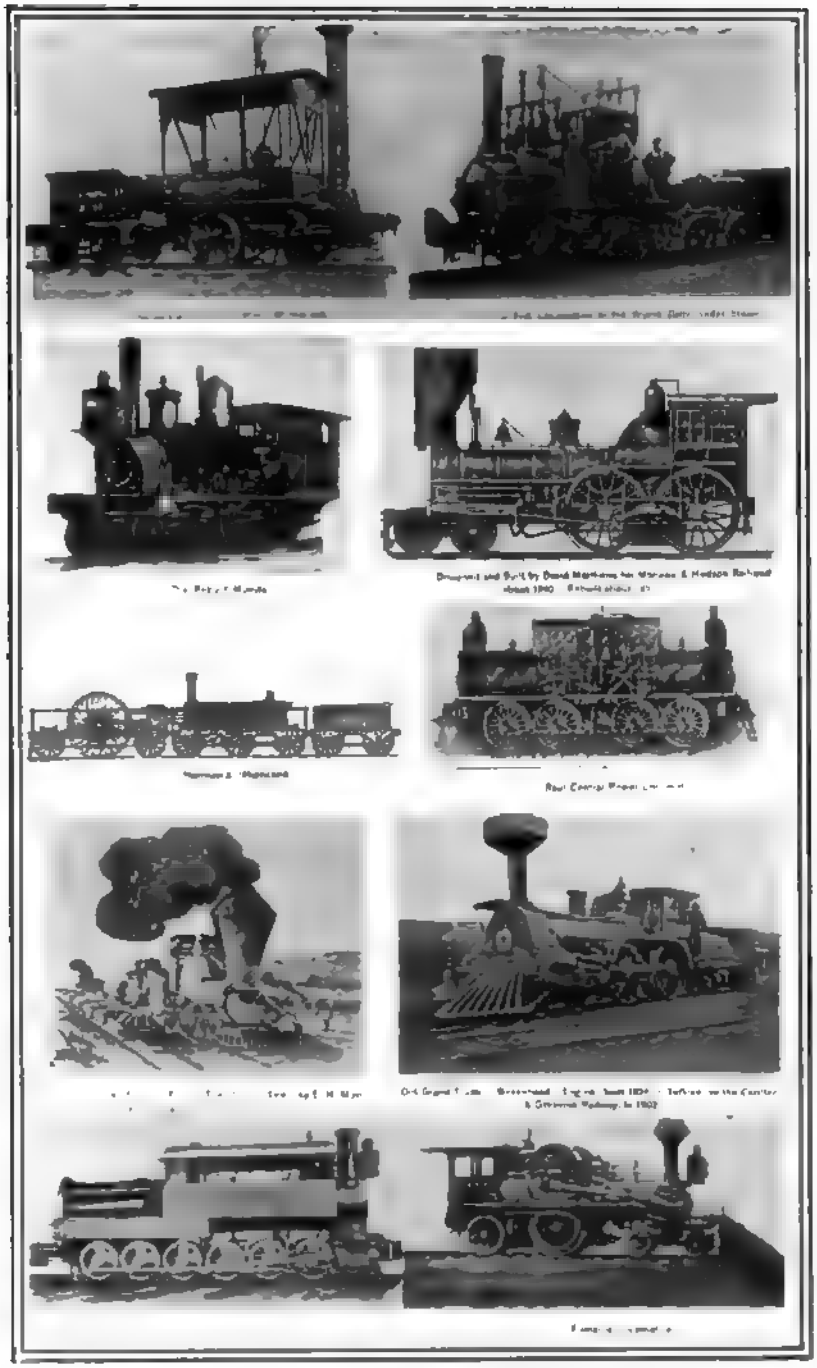
Nearly Two Miles a Minute.

Our modern engines are said to have reached a rate of speed, for short distances, of as high as 120 miles an hour. In other words, they have been able to equal the wind in velocity, even in its fiercest recorded gales.

To-day every endeavor is made to have trains on time. Some time ago the writer came from a Western city on a famous express train for New York. When the train passed a certain town in Indiana, it was two minutes late.

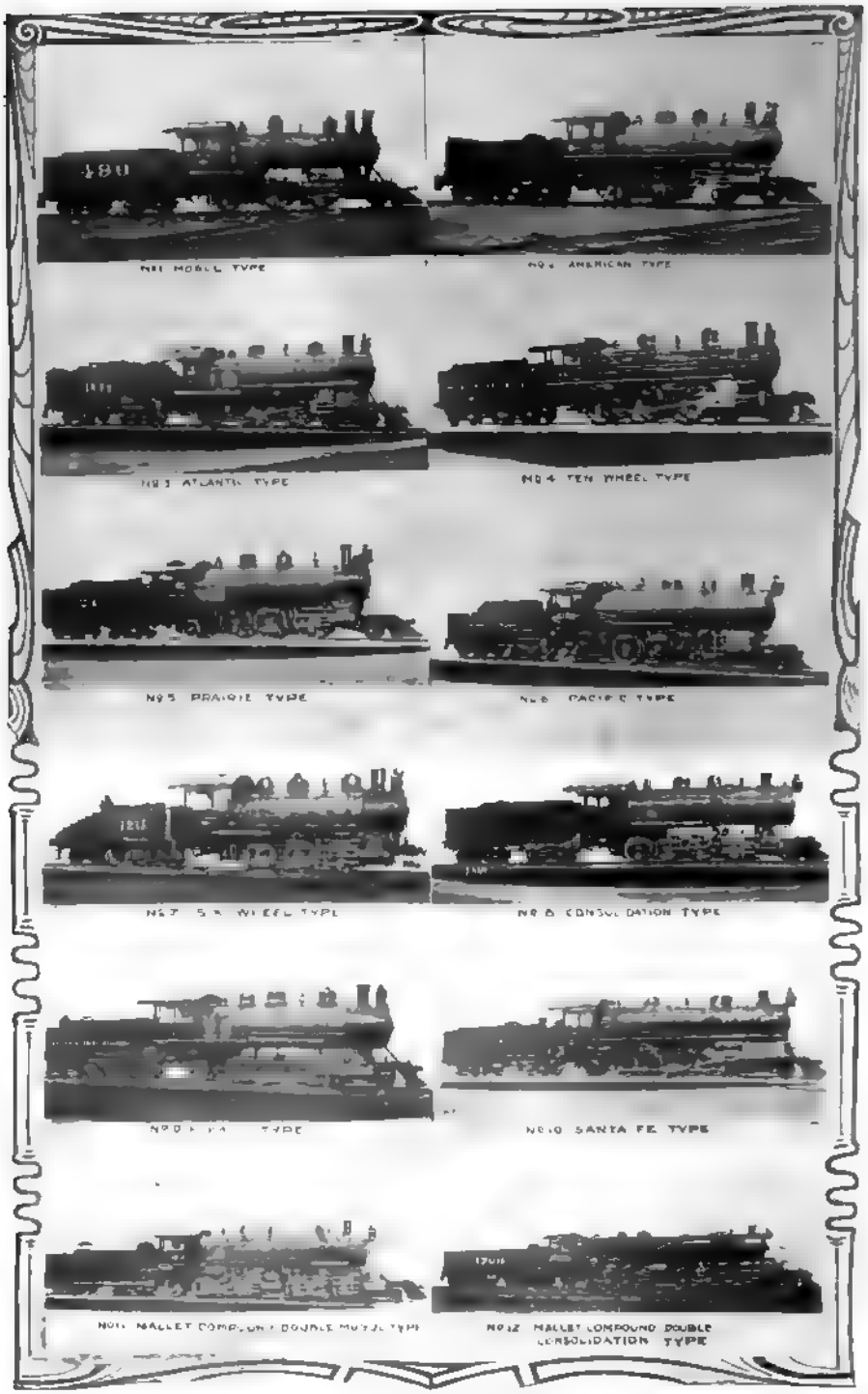


A CONTRAST: THE EARLIEST AND A MODERN LOCOMOTIVE, DENVER & RIO GRANDE RY.

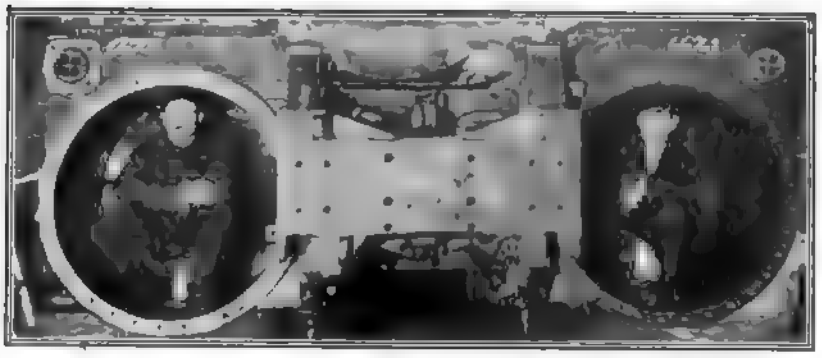


EARLY AND MIDDLE PERIOD LOCOMOTIVES

[illegible] PERMISSION FROM ANGUS SINCLAIR'S DEVELOPMENT OF THE LOCOMOTIVE



TYPES OF THE MODERN PASSENGER AND FREIGHT ENGINES, FOUR TO SIXTEEN DRIVING WHEELS.



IN THE CYLINDERS OF A DELAWARE & HUDSON MALLET

Making up Time.

To a divisional point about 14 miles away was a piece of straight track, perfect for fast running. When they had covered this distance and arrived at the station, the train waited even after the engines were changed. The writer asked why the train did not start, and was told that they were waiting for the schedule to catch up.

Thus three or four minutes were gained on a run of 14 miles, along a route where the scheduled time was probably 60 miles per hour. Just how fast the train went on this particular run, the writer does not know, but the speed must have been 85 miles an hour.

Familiarity and Contempt.

Trains which make a mile a minute or more for an hour on certain sections of their runs are so numerous that telling about them would scarcely be of interest. But when man is able to enter a heavy, ponderous vehicle which will take him at practically so high an average for several hundred miles, and for short distances even more rapidly, then the interest in the speed made revives, and one feels a desire to know a little more about these wonders of the twentieth century.

For instance, in 1901 a little run was made from Fleming to Jacksonville, down South, at a speed, it is claimed, of two miles a minute—120 miles an hour. This is not fully vouched for.

The Philadelphia & Reading claims to have gotten one of its trains to speed at 115 miles an hour in 1904.

The Central's Record.

The New York Central glories in one of its trains in 1903 running about seven and a half miles in four minutes—a speed of 109.35 miles an hour.

Long distance runs.

Even more astounding records are claimed for long distance runs. For instance, the run from Crestline, O., to Clark Junction, Ind., a distance of more than 257 miles, is said to have been covered at an average speed of 74.55 miles an hour.

England's Good Record.

Highest honors along this line of endeavor are claimed by England, which has figures from the famous Great Western Rail Road of a run of 118.5 miles made in an hour and twenty-four minutes, an average of 84.6 miles an hour.

The Pennsylvania Rail Road made the entire distance between Chicago and Pittsburg, 468 miles, at an average of 69.69 miles an hour, the greatest record of its kind, as it included stops.

Rushing 1,000 Miles.

The New York Central between Chicago and New York, has had its trains make an average run for the 960.52 miles, of 60.28 miles an hour, excluding stops.

Another fast run is the one made by the New York Central in September, 1895, from New York to Buffalo, a distance of 436½ miles, in 407 minutes. This means 64 1-3 miles an hour, including two full stops and 28 slow-ups.

70 Miles an Hour Daily.

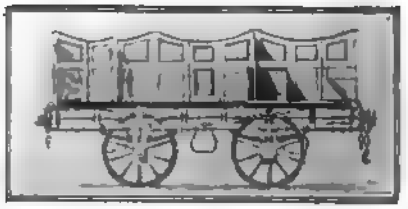
In 1897-8, for four months, train No. 25 on the Philadelphia & Reading, made a remarkable demonstration of speed. A synopsis of the train dispatcher's sheets gives an average speed of 69.8 miles an hour, with a maximum of 87.8 miles. The trains were made up of from five to seven cars. For continuous work this is difficult to surpass.

"The Scott Special."

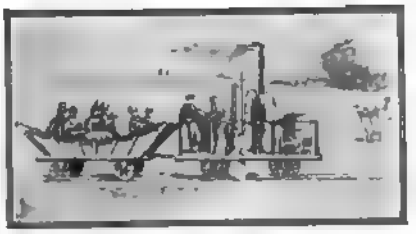
In 1905, the "Scott Special," on the Atchison, Topeka & Santa Fe, left Los Angeles for a continuous trip to Chicago. The distance of 2,245 miles, more than two-thirds of the way across the continent, was covered in five minutes less than two days, making an average of 52 miles an hour for the entire distance, including the extensive mountain climbs, many stops and changes of engine. The high speed officially recorded for a given distance was 106.1 miles per hour.

Remarkable as are these runs, probably still higher speeds will yet be attained, for at no period since the beginning of locomotive construction, have progress and improvement in the refinement of locomotive design been more active than now.

OVER A MILE A MINUTE BETWEEN PHILADELPHIA AND ATLANTIC CITY, P. & R. RY.



STEPHENSON'S FIRST PASSENGER CAR, 1825.



EARLY PASSENGER CAR, DRAWN BY "TOM THUMB."

EPOCHS IN THE PROGRESS OF RAIL ROAD EQUIPMENT.

Back Through the Years.

As one in thought strolls back through the aisle of the years halting at the time of the genesis of the Rail Road, one sees on every side, as in a museum, strange, queer, if not weird contrivances, of which the world once was proud and upon which it gazed almost in awe.

On this side, one sees an old strap rail; on that, a six or even a two or three-ton locomotive or a passenger car not unlike the model of the Noah's ark with which children play in the nursery; or, again, a freight car which scarce would bear more than the load borne by the farmer's wagon of to-day.

Homeward Bound.

As we retrace our mental steps and peer about us, we find the abandoned, outgrown equipment improving in capacity and convenience. It may be that with each year the change is ever so slight, but still the development, the improvement, the evolution is there.

Gradually, we approach the shapes with which we are familiar to-day. Sixty, 70, 80, 100, even 300-ton locomotives, passenger cars with greater and greater comforts, candles replaced by oil for light, oil giving way to compressed illuminating gas, and gas in some cases making way for the electric bulb and the dazzling headlight—the latter in strange contrast to the original headlight, a truck with a bonfire on it pushed along in front of the engine—all are to be found here.

Improving Each Detail.

And so we continue our examination of the long list of equipment, of engines, cars, track, bridges, stations, signals, until we step into the light of 1911, and gaze upon the modern Rail Road and its

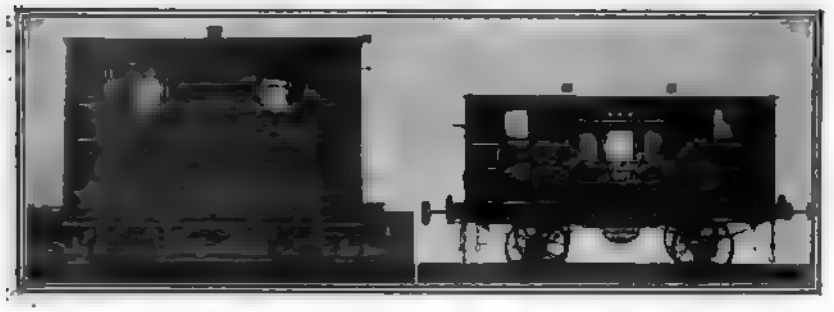
FOUR EARLY TYPES OF RAILWAY CARS. THE BEGINNING OF THE PASSENGER CAR.

appurtenances. But now we see everything with a new appreciation, for we have looked upon the modest beginnings from which they sprung, and realize how wonderful has been the development wrought in less than eight decades.

Cars.

How They Have Changed in Size and Form.

The first English Rail Road car resembled a small log cabin on wheels, fitted to the rails. For some time it was customary for passengers owning carriages to put them on small flat cars, the latter being coupled to the train, the traveler retaining his seat in his own vehicle.



FIRST ENGLISH CARS

Hodge Podge.

There was no uniformity of design in construction; the cars for many purposes and wagons of many different patterns were in the same train, but because it was the custom of the time, little attention was paid to the lack of harmony.

It was 1831 before the tires of car wheels were made conical or flanged, instead of flat, in order to round curves. This happy idea originated in England and was adopted everywhere. Before that time the flanges were on the tracks.

Sleeping Quarters.

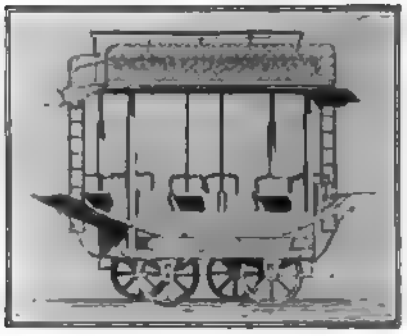
In 1838 sleeping cars were run between Philadelphia and Baltimore. The Baltimore Chronicle on this occasion said: "Nothing now seems wanting to make Rail Road traveling perfect—except the introduction of dining cars."

A certain newspaper correspondent seemed to take a different view, for he said of the older sleeping cars: "The lower berths were so short that you had to lie in one like a half opened pocket knife, with your knees in the air and the bed clothes pushed up like a tent. You did not need to be pious in order to thank heaven when you got out of that car."

These cars were without heat, and light was supplied by two candles. There were no toilets, lavatories or water coolers.

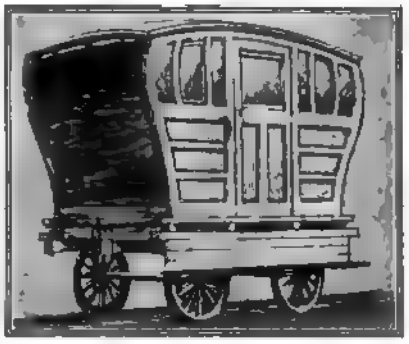
The Comforts Lacking.

The first passenger cars seated only 6 persons. In 1855 the passenger car in general use was 50 feet long, 10 feet wide, and 7 feet high, with seats for 60 passengers. The Erie Rail Road had cars 60 feet long, which seated 74 passengers. Good car springs, however, had not yet been invented, and the cars shook the passengers unmercifully in rattling over the poor, rough, weak road bed, the size of the cars only adding to the sufferings from the pitching.



A CAR SUCH AS DRAWN BY HORSES ON THE B. & O., 1830.

TYPE OF CAR USED IN NOVA SCOTIA, 1838



Capacity.

A nine-ton load was the limit for a freight car in 1855; the average load was only one-fourth of that, however, or 2½ tons. The first freight cars on the Boston & Albany were just large enough to hold two hogsheads of molasses.

The sanity of one director of this road was doubted because he predicted that a time would come when a total of as many as 85 such cars would be needed between Boston and Albany. Probably 10,000 cars, each capable of carrying 30 hogsheads of molasses, or the equivalent of 150,000 of the old kind, are in that service to-day. Just prior to 1850 the first refrigerator car was used.

A Six-Ton Wonder.

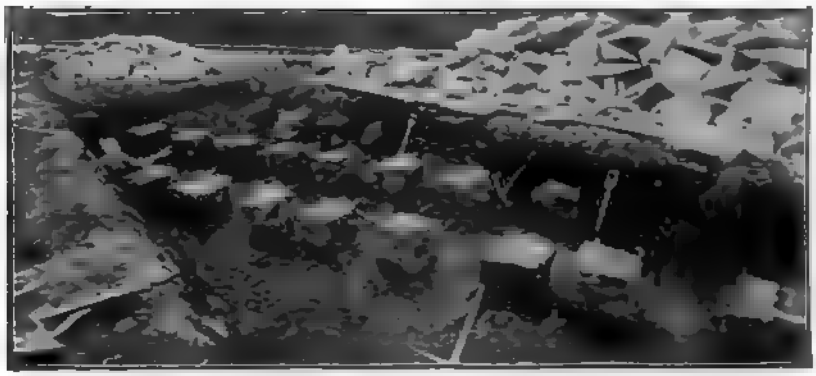
In 1864 it was considered notable that mammoth trucks, especially manufactured for the purpose, proved strong enough to bear a 50-ton cannon. Before 1870 few freight cars had a capacity of more than 10 tons. The sudden increase which occurred about that year has been explained as resulting from the following simple operation.

"Inscriptions on the bodies of cars announcing their capacity as 10 tons were superseded by figures setting forth that they could carry 15 tons." After 1880, however, the standard of new cars was actually 20 tons.

Stock or cattle cars have undergone great improvements, notably in the last few years, and now have ventilating slats, food bins and water troughs, so that cattle are fed en route, instead of being starved, as in the olden days.

Moving Tanks. Before the days of the pipe lines tank cars were very important; in fact, they still are used in many places to transport coal oil and cottonseed oil.

The first elevators for rapid unloading, storage and delivery of grain were built by the Toledo, Wabash & Western, in the early sixties.



STONE BLOCKS, FORMERLY USED INSTEAD OF TIES TO SUPPORT THE RAILS, P. & R. RY.

Modern Steam Road Appliances.

An Important Accessory. In 1837 the first engine was run which boasted of a whistle. On the first trip, from Paterson to New Brunswick and back, the blowing of the whistle so overworked it that there was hardly enough steam to operate the locomotive. It was five years later before the first signals between the conductor and the engineer were established by means of a cord running back to the cars and attached to a stick in the locomotive. The stick was soon replaced by a bell.

It was not until after 1875 that many conveniences, facilities and inventions which distinguish the modern American Iron Road, were instituted. Iron bridges replaced wooden ones, for it was found that the former were much more substantial, and therefore economical, and then steel came into use in place of iron, as it had greater tensile strength and toughness.

Standard Gauge. In 1876 came the reduction of the then widely used six-foot gauge to one of 4 feet 8½ inches, the standard to-day.

In the beginning of the Rail Road era, track was made of wooden stringers with the so-called "strap rail," a light strip of iron fastened to the upper side of a wooden rail.

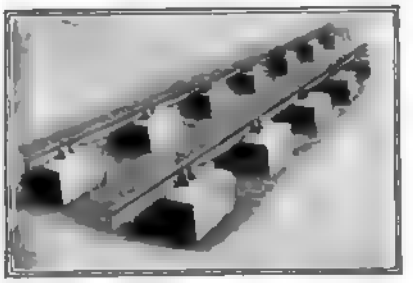
When Colonel Robert L. Stevens succeeded in having his iron rail section rolled in England, and laid it on the Camden & Amboy Rail Road in 1832, modern Rail Road track was fairly started toward the form it has at the present day.

The Airbrake. Few improvements were of more importance than the airbrake. The quicker stops than were possible with hand brakes, and the perfect control of the train by one man, the driver, or engineer, gave it wide popularity. As early as 1875 the passenger trains of nearly all the principal roads were equipped with it. The airbrake also has made possible the long modern freight train, to control which by means of hand-brakes would be practically impossible, and eliminated the danger of brakemen having to run from car to car to set the brakes.

Meeting the Demand. Rapid increase in traffic and weight of locomotives and cars was followed by gradual increase in the weight of iron rails. At last the iron itself could bear no further increase of weight, and something better had to be found to enable progress to maintain its wonted pace. As seems to happen nowadays, when a necessity arises, the proper means of filling it was invented. In this case it was the steel rail which suited the requirements.

Steel already had taken its place in Rail Road economy. Steel locomotive tires of Krupp manufacture were first used in America in the early sixties. They were found to be at least five times as serviceable as the iron tires. Steel fire-boxes also were introduced at this time.

LIFTING TEN TONS OF RAILS BY AN ELECTRIC MAGNET AND TRAVELLING CRANE.



FOUR-FOOT FISH-BELLY RAILS ON BLOCKS, 1798.

Bessemer Steel Rails. Bessemer steel was first used for rails in England in 1867, but its great cost and the then difficulties of manufacturing it, stood in the way of extensive use. In 1875 steel rails cost $120 per ton, and iron rails $70, and the equipment of even the most prosperous roads with steel rails would have meant a most severe drain on their purses. Still, steel will stand up under loads which iron could not bear. It has flexibility, and after having been depressed by a passing train, will come back into place, remaining straight until another train puts its weight upon it.

The T-Rail. The form of the rail is still carefully studied and improvements are constantly sought. The prevailing shape is the T-rail. But the rail that is best for Rail Road purposes is not always the cheapest. The difficulties of

producing a large head to take much wear and a broad, thin base in order not to cut into cross ties, is being met by the use of tie plates, to help transfer the load to the ties.

Nickel steel rails have been experimented with. Manganese steel is in successful use for frogs and switches, and rolling it into rails has been attended with some success; its further use is hoped for. Vanadium, tungsten, chrome and titanium are also being experimented with.

Binding Rails to Ties.

Fastenings for fixing rails to ties early took the form of hook-head spikes driven into the tie. There have been improvements in an increase in size, a change in shape, and the sharpening of the point.

The word tie originated when it was first found necessary to bind the two rails together to prevent spreading. They followed the stone blocks and came into use in America almost with the very beginning of the road with rails. Wooden ties have increased in price and decreased in quality with the rapid denudation of the forests. Recently one of our Rail Roads imported from Japan at a cost of over $2 each, 200,000 ties of a specially durable wood. Another road has been planting trees along its lines, and has even purchased a large tract of wooded land. As fast as trees are cut down to supply some part of the road with ties, young trees are planted.

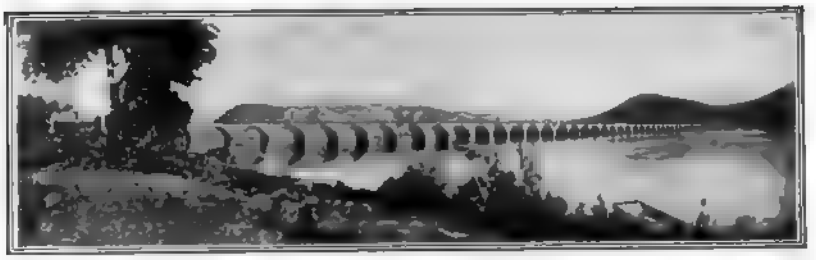
Creosoting has been found very beneficial, and it is expected that this means of preservation will nearly double the life of a tie, although its cost is also about doubled thereby.

Inefficient Substitutes.

Hundreds of inventions in the way of substitutes for wooden ties, including those of steel, have been patented in the hope of solving the tie problem; most of them have proved impracticable. A very few, consisting of metal and concrete, hold some promise of success.

Ballast performs the double function of giving drainage and distributing the load to the road bed. It has been in use since the birth of Rail Roading, but its depth under the ties has been increased, making the road bed more substantial. Burned clay, called

CULVERT AND TUNNELS D. L. & W. RY.



STONE BRIDGE OVER THE SUSQUEHANNA, ROCKVILLE, PENN RY.

gumbo, now takes the place of sand and dirt in some cases, and broken stone that of gravel.

Drainage Makes Good Bed.

The smoothness and alignment of a Rail Road depend largely upon a substantial road bed, which we can only get by means of adequate drainage. Water is the great enemy to a solid foundation. Nature abhors a Rail Road ditch almost as much as she does a "vacuum." Indeed, she seems to look upon the former as a vacuum, for she makes constant effort to fill it up.

In order to fill the ditch she is quite ready to use the road bed and ballast, or the wash from a cut or hillside, and her not infrequent success keeps the trackman busy.

Culverts.

Openings crossing the road bed are made at every depression in the land to allow escape to streams from melted snow or large rainfall, to provide against the possibility of these washing against the track.

Stone and brick boxes were originally used for culverts. In recent years vitrified and iron pipes and masonry have largely supplanted them, and to-day concrete is being employed, as it is in many other engineering works.

Traffic Improves Road Bed.

Road bed, in distinction from other parts of the Rail Way, may gradually be improved by traffic, presupposing always that proper drainage is provided. The steady pressure compacts it, with only the loss of such additional ballast as may be driven into it.

Naturally an article restricted by space limitations, as is this one, can touch on only some of the many epochs marked in a history replete with important events. The developments in the mechanical field, have been scarce touched upon; the gradual evolution of the numerous designs in freight equipment alone would require page upon page; the progress of repair shops from practically a carpenter's tool-box to great buildings occupying acres of ground has been most noteworthy.

Notwithstanding the many omissions, this résumé suffices to show the great development which has taken place in the details of Rail Road appliances; it proves what seemingly insurmountable difficulties have been overcome so completely that they seem only milestones along the way, and, finally, it shows how thorough and successful have been these agencies in achieving comfort, convenience, progress, and prosperity.

COST OF STARTING AND STOPPING A TRAIN.

A Little Thought of Cost.

The traveler who studies the time table of a Rail Road pays scant heed to the stations marked "f," meaning flag station, points at which the train stops only when a stop flag is displayed to indicate that a passenger wishes to get aboard.

That there is any economy in the train dashing by stations except the saving of a few seconds of time rarely occurs to the layman. Probably he would be incredulous if told that it meant a saving of dollars and cents on every trip.

The Importance of Trifles.

Experts place the cost of stopping and starting a train at from 35 cents for a 400-ton passenger train running at 45 miles an hour to $1.00 for a 2,000-ton freight train at a 35-mile speed. An eminent authority on the subject—George R. Henderson—estimates the cost at 75 cents, although many of the items are so minute that it is not an easy job even to approximate them. But, judging from the estimates of others, Mr. Henderson's figures seem correct. In making his deductions, he figures as follows:

How Details Aggregate.

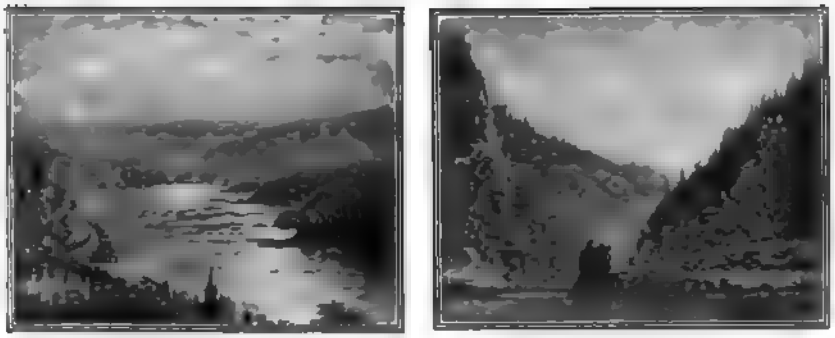
To accelerate a 2,000-ton freight train to 27 miles an hour on the level requires 10 minutes, 34 seconds and 19,113 feet of distance, and also requires 213 pounds of coal and 160 extra gallons of water. The stop requires 16 seconds and 320 feet. A stop in so short a distance, while possible, is seldom made, longer time and greater distance being taken. Four pounds of coal are necessary for full application of the brakes.

The cost of the coal used in stopping and starting is 10 cents; of the water, 2 cents. The total time lost for stopping and starting is 10 minutes, 50 seconds, not including the length of the stop. The wear and tear on the engine is not less than 25 cents.

Time Is Money.

The enginemen of this train receive a total of, say, 70 cents an hour, so that the time spent in stopping and starting, 11 minutes, costs 13 cents in their wages. For the trainsmen, at 80.5 cents an hour, the elapsed time costs 15 cents in wages. Interest averaged at 10 cents an hour is 2 cents. Including also the wear and tear on brake shoes and car wheels makes the total cost of stopping a train of this weight about 75 cents. It should be remembered that application of the brakes simply means the setting of one piece of steel against another one. The brake shoe is originally two inches thick, and is ultimately worn down to almost nothing.

These figures indicate that neither a small shipment of way freight nor a single passenger traveling for a short distance brings in revenue sufficient to make up for the actual expense incurred in stopping the train to permit the passenger to board or leave the car or the freight to be loaded or unloaded.



HARPER'S FERRY. DELAWARE WATER GAP

FAMOUS GAPS IN MOUNTAINS THROUGH WHICH RAILWAYS PASS

SECTION XXXV.

THE ELIMINATION OF NATURAL OBSTACLES TO PROGRESS AND PROSPERITY.

Steep and Crooked Ways—Grades and Curves.

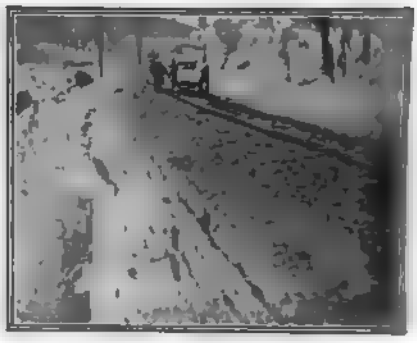
Did you ever see a man who could run up a long flight of stairs, or climb a steep hill or a mountain without severe exertion and fatigue? Did you ever see a horse or a team that would not be similarly affected in performing a like task?

Grade Difficulties.

The same amount of energy required to overcome such an obstacle by human and animal power is necessary to overcome it by mechanical force. The most powerful and perfect equipment of a Rail Road will only modify, it can never eliminate, the effort to ascend grades, which is but overcoming the attraction of gravity.

The problem reduces itself to lifting the load vertically up the total height or elevation of the grade, as though in an elevator, or drawing a bucket of water out of a well by a rope, against this great force, with the amelioration of the length of the slope along which it is pulled before it reaches the top of the grade.

RETAINING WALL, D. L. & W. RY.



CAPE HORN WALL, CAL., S. P. RY.
A DROP OF 2,500 FEET.

Straight and Narrow Path. Curves are scarcely less detrimental to economical operation than grades. The increase of effort to negotiate curves is not so much felt in wagons as in the case of Rail Roads, for in the former case there is not the friction of the rails on the flanges of the wheels to add to the resistance, but it is present, nevertheless.

On a Rail Road, from the front wheel of the locomotive to the last pair of wheels on the last car, there is the constant tendency of every car wheel and truck to travel in a straight line, just as a rope with a powerful force pulling at one end, and a heavy load at the other, will straighten out and become taut. The wheels are only deflected by the inner side of the outer rail forcing the flange of the wheels to take the curve.

The Course of the Wheel. In rounding a curve the flange pushes against the rail with tremendous force. This is caused by the centrifugal force of the load, the speed with which the train is moving, and the fact that the wheel base, from 21 feet on locomotives to 64 feet long on passenger cars, is fixed in a rigid frame. The grinding of these two pieces of metal together acts as a powerful brake and absorbs a vast amount of energy. All of us have heard the sound caused by this friction, somewhat like a whistle or a staccato scream.

The inner face of the outer rail on any heavy curve is soon worn from this cause. When a third or a fourth of the head of the rail has been eaten away by this constant grinding, the rail has to be replaced.

Limitations. There are sharply defined limitations to the curves which engines and cars can negotiate, just as there are in turning a short corner with a very long, coupled wagon, or in trying to carry a large piece of furniture up a narrow stairway with many turns. The length of a hook-and ladder truck usually requires that in turning a street corner the rear wheels be steered in addition to the direction given to the front wheels.

The greater the speed at which a train rounds curves, the greater, naturally, is the absorption of power. The speed of a

train rounding a curve is always checked, partly by the engineer for the sake of safety, but in any event by the power absorption of the curve.

Giving Direction. When directing a carriage the horse is guided so as to give the direction of the curve, the wheels automatically following. The front wheels of the automobile are steered in the desired direction by hand, the hind wheels naturally tracking and following.

We would scarcely ride behind such an enormous vehicle as the locomotive, at the speeds made nowadays, if we had to depend upon the human hand to guide it over fields and mountains. The rails, however, leave nothing to chance and to the imagination, but shape the course of the engine in a definite manner.

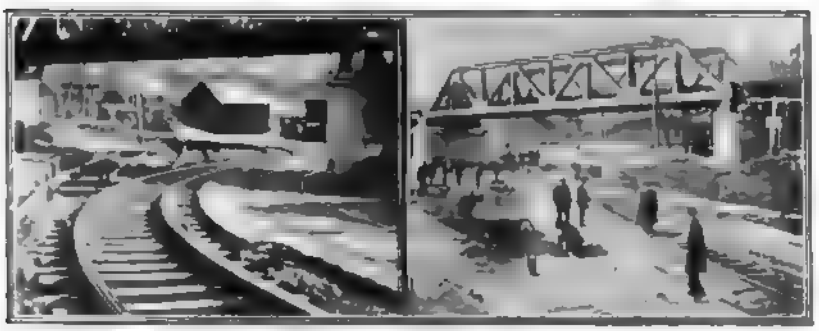
Cause for Nervousness. Otherwise we would probably have the same feeling of apprehension as the Irishman, who, for the first time, saw a tunnel. A train was just rushing into it as he and a friend arrived upon the scene. Pat gazed in wonder. After a moment's silence, he said, thoughtfully: "Moike, Moike! Sure, an' there'll be the devil to pay some day if the machine misses that hole in the ground."

Lessening the Pressure. A man running around a corner naturally leans his body toward the inner side of the curve to keep from losing his balance, and bicycle tracks, etc., are banked so that the body can preserve the same center of gravity. For the same reason the outside rail is elevated considerably above the inner rail.

The difference in the elevation of rails is sometimes as much as six and one-half inches in the four feet eight and one-half inches of the standard width of the track—a rise of one inch in nine.

Strengthening. It is customary to lay a guard rail inside the regular rail on a sharp curve. This catches the flange of the wheel and helps to deflect it, so that the strain is distributed. In addition the rails on curves are usually doubly-spiked and braced.

Reverse curves, or curves like the letter S, are particularly trying. Then the wheels of different sections of the train are trying to straighten themselves out in opposite directions at the



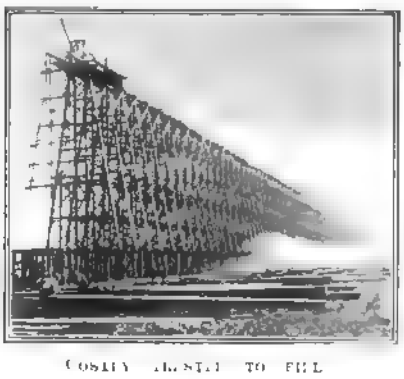
BEFORE AND AFTER REDUCING CURVATURE BY CUTTING OUT A REVERSE CURVE

same time, and it is to some extent like a tug-of-war. One curve is pulling against the other, and both against the draw bars, the locomotive and what is most noticeable, against the coal pile.

Bringing It Home. To make clear the obstacle which a curve presents: have you ever tried to drag a rope with a load attached to the other end of it around the corner of a house? Then imagine you had to pull it around the entire house—and not only once, but 50 times.

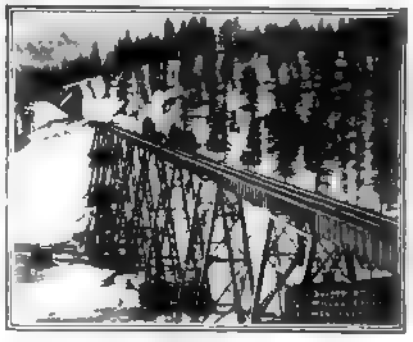
If you have ever seen a great steamship being docked, the momentum checked and its great weight brought to rest, merely through the friction gained by circling the hawser a few times around a pile or snubbing post, you will have some idea of the power, resistance and friction of curves.

A Compromise. Efforts are made to lighten the strain on the locomotive by reducing the grade on sharp curves. When trains are too heavy, however, they are sometimes stalled at such points. On an extraordinarily heavily curved part of the Canadian Pacific, where the locomotive between the points overcomes an elevation of 2,300 feet in 13½ miles, passenger trains can crawl along at only 12 miles an hour and freight trains make only eight.



COSTLY STEEL TO FILL

THE WESTERN PACIFIC CROSSING THE S. P. RY



Power Destruction. On another particularly heavy piece of three per cent grade, which is an ascent of only 157 feet to the mile, while there are 30 miles of track consisting almost entirely of curves, a powerful consolidation engine capable of hauling 50 or 60 cars on ordinary level track, can haul only a nominal load of five to eight cars. In other words, the maximum capacity of the engine is reduced practically nine-tenths.

On the 158 miles of the Southern Pacific from Sacramento to Sparks, there are 21,252 degrees of curvature, equivalent to 59 complete circles, or a complete circle for every two and two-thirds miles. If these curves were carried out in actual circles, the train going to San Francisco would face New York 59 times in these 159 miles.

A Tangled Skein.

On the Southern Pacific line from San Francisco to Ashland, Oregon, 431 miles, there are 30,310 degrees of curvature, which would constitute 84 complete circles. On the Sunset or Southern Pacific, from San Francisco to El Paso, there are 33,277 degrees of curvature, and the track, therefore, is wound into a corkscrew of 92 complete turns or circles.

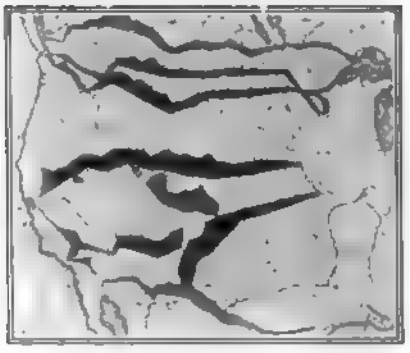
Four Mountain Ranges.

The stumbling blocks, or mountains and valleys, with which our country has been so plentifully blessed, make necessary all these curves. They, also, are responsible for the long and steep grades on many of our Rail Road lines. Few stop to realize that in going from coast to coast most of our transcontinental roads have to scale four mountain ranges—one mountain range in going from the Atlantic coast to the Mississippi valley, and three from the Mississippi valley to the Pacific coast.

An inhabitant of the United States who has widely distributed interests is in the same position as a man living in a house in which he is compelled to walk up twenty flights of stairs and down again to get from his dining to his sitting room; then up and down 40 flights to get from his sitting room to his bed room, and so on.

Physical Ups and Downs.

These are relatively the vertical detours or elevations caused by the Alleghanies, Rockies, Wasatch and Sierra Nevadas. We illustrate these physical "ups and downs" of Rail Roads by giving condensed profile maps of some of our transcontinental roads.



THE ALTITUDES OVERCOME BY TRANSCONTINENTAL LINES.

CURVES AND BREAK IN SNOW SHEDS, U. P RY

If a mountain a mile high, or, say, 5,000 feet, have an air-line distance of only five miles between the foot, where the Rail Road starts to climb, and the top, where it crosses, the height of the mountain would compel the construction of 100 miles of zigzagging track to get a fairly economical line.

Where Distance Economizes.

If a fair business develops it is ultimately far better and cheaper, despite the extra distance and additional cost of construction and maintenance to build a longer line, say, 200 miles long, at a half per cent grade to overcome such a height. Perhaps the only reason why Rail Roads do not always build the longer line, the cost of operation over which is so much cheaper, is lack of funds or natural difficulties insurmountable from an engineering standpoint.

The distance which the iron horse climbs on many a Rail Road line drawing its heavy load of freight or passenger cars behind it, is greater than the height of any peak.

For instance, the total ascent on the Atchison, Topeka & Santa Fe, from Chicago to National City, amounts to 34,426 feet. In other words, great, cumbersome, heavy locomotives climb the equivalent of a mountain nearly seven miles high, approximately a mile higher than Mount Everest in the Himalayas, the highest in the world, and haul over it vast loads of the products of the nation.

Mountain Climbing.

On the Northern Pacific, from Tacoma to St. Paul, the ascents east amount to 18,337 feet. The highest peak in the United States, Mt. Whitney, in California, rises only 14,500 feet above the level of the sea.

On the Canadian Pacific, from St. Johns to Vancouver, 2,384 miles, ascents aggregate 38,301 feet west, and those east 38,307 feet. These are each more than six times as high as the greatest of the mountains along our Eastern coast, Mt. Mitchell and Mt. Washington.

Nearer Heaven.

On the Southern Pacific, from New Orleans to San Francisco, the ascents west are 25,980 feet, and those east 25,986 feet. Pike's Peak, the best known mountain in America, only a few hundred feet lower than the highest, is only about half as great as the height these Rail Road trains climb.

On the Union Pacific, from Omaha to Portland, the ascents east amount to 18,171 feet. This also is considerably higher than our highest peak, and is a fifth higher than Mt. Rainier, in Washington.

Three Miles Up.

On what is now the Southern Pacific, over the original Union and Central Pacific lines, from Omaha to San Francisco, the ascents east aggregate 18,575 feet, again well toward a mile above our highest peak.

What an additional amount of work is done by the Western Rail Roads over that performed by those in the East, and why rates are higher, can be realized to some extent when we call attention to the fact that the highest elevation which the latter have to overcome is 2,250 feet, one fifteenth as much as the aggregate of those of the West, but even this presents a serious obstacle, difficult to overcome.

There is little really level Rail Road anywhere. There is a general upward grade from the Atlantic coast to the top of the Alleghanies, and thence to the Ohio it is reversed.

The Barrier of Rivers. There is a rise or local watershed between each stream running north and south into the Ohio. After the Mississippi is reached there are up and down grades for every stream or watershed running north and south, emptying into the Missouri. There are broad up and down grades west of the Rockies. Thus the surface of the land is like an immovable frozen sea. Whenever you see a stream, or water flowing in a ditch by the side of a Rail Road remember that this is proof of a grade of some kind, or the water would form a stagnant pond.

Many Easterners think our prairies are perfectly level, but as a matter of fact a very large portion of them is exceedingly rolling. It cost thousands of dollars a mile to regrade the Texas Pacific and Iron Mountain through Arkansas, Texas and Missouri, a country that the uninitiated would think absolutely flat.

Carrying Up a Mountain. Did you every carry a trunk up a single flight of stairs? If so, you have some realization of the exertion required. Suppose you had to carry a locomotive and train of loaded cars up a flight of stairs, what would you think of the task? Yet some of the grades which we have mentioned are as long as 3,800 ordinary flights of stairs. If the stairway had many twists and turns the work would be even more burdensome.

Suppose you had to throw, pull, or in any way move a locomotive and a train of cars over an ordinary shanty, or over a three-story house, would the task appeal to you? Yet in Rail Roading trains are hauled over the equivalent of 3,250 shanties, or 1,000 ordinary three-story houses.

CROSSING THE ALLEGHENY MOUNTAINS BY INCLINES, PENNSYLVANIA RY., 1850

The Cost of Getting Trains Over Grades.

Reference has been made several times to the fact that the reason grades are so feared by the Rail Roader is the cost of overcoming even the lightest of them, which expense is added to very materially if they be steep or of great length.

The Proof of the Pudding.

We will compare, for the purpose of illustrating how a grade affects the cost of operation, the cost of running two trains of 1,430 tons gross each. One train is running at a speed of only ten miles an hour, upon a uniform grade of one per cent, or 52 feet to the mile, for a distance of 150 miles. The other train runs over a division of the same length under practically the same conditions, but only half the distance is uphill, while the other half is down hill, both at a one per cent grade.

The only difference between the two roads lies in the second 75 miles, which the first train ascends and the second descends.

Double Coal and Water.

On the steadily upward grade the locomotive usually requires a helper, and the consumption of coal is 53 tons. At only $1.50 per ton, this costs $79.50. On the line only half the distance uphill, almost exactly one-half that quantity of coal is required, costing $39.75. The cost of water is in the same proportion—$9 to $4.50. The repairs cost $31.50 on the first line mentioned and only $16.50 in the latter case.

As the speed between terminals of the train which has the continuous and, therefore, greater aggregate grade to overcome, is slower than that of the train whose down-grade accelerates the rapidity of movement, the former trip takes more time. As explained before, this increases the aggregate amount paid to engineers and train crew.

Wages.

The engineers' wages for the total trip of 150 miles are $12.60 and $10.50, respectively. The trainmen receive $14.49 on the train on the continuous upgrade, against only $12.08 for those on the other line.

The interest allowance is $2.30 for the train out upon the road a longer time, against $1.70 for the other. Such items as lubrication, supplies, allowance for renewals, handling, train supplies and car repairs vary very slightly.

Difference Per Mile.

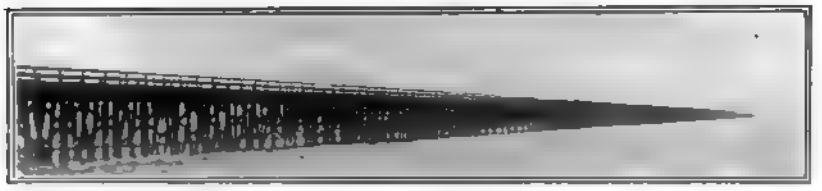
The total cost of the 150 miles run upon the one per cent upward grade is $187.94, and on the line up half the distance and down the other half, it is only $123.58. The cost of operation, therefore, varies $69.61,—46.4 cents per mile, almost a dollar every two miles.

Figuring approximately on this basis, think what would be the reduction in cost of operating our Rail Roads if the grades of all our lines were to be done away with or very considerably reduced, especially when computed for the 1,129,000,000 train miles covered annually. Then you will appreciate why the Rail Roaders want to smooth out their roads and thus do away with this great and eternal enemy to economical operation.

Relocation Profitable.

It does not require a Rail Road man to see that enormous sums can and should be spent on the great Rail Roads handling large traffic, to relocate and rebuild their lines with lower gradients.

Relocation not only would be advantageous to the Rail Roads, but to the public, enabling the great modern carriers to charge



THE LUCIN CUT-OFF OVER THE GREAT SALT LAKE, COSTING MANY MILLIONS

lower rates, to say nothing of the increased celerity with which the business of the nation could be transacted.

The Highest Grade.

Modern practice has determined that it is uneconomical to build a Rail Road with a grade exceeding one-half of one per cent, a climb of only six inches in every 100 feet of track, or 26.4 feet in the mile. There are, however, few Rail Roads with sufficient traffic to warrant the large expenditures necessary to secure a reduction to so low a maximum.

True, these improvements will cost millions—perhaps hundreds of them—and will mean much increase of capitalization. But should we oppose the Steam Roads in their endeavors to put themselves into a position to do work economically for us? Is it wise for us to quibble about increase of Rail Road capital, when the improvements made will permanently eliminate such natural obstacles to operation at a low cost?

UNREALIZED GEOGRAPHICAL BARRIERS AND UNSEEN DISTANCES.

The Necessarily Long Way Around in Rail Roading.

Disadvantage of the Rail Way.

The fact that a road connecting two points is seldom as short as the air-line distance between them is even more true of Steam Roads than of county or state roads. The wagon traveling on the county road can make sharp turns, but the locomotive on the road of steel requires hundreds of feet of distance to make even a partial turn. The former can also ascend grades many times steeper than Rail Road trains can negotiate.

Detours aggregating many miles are caused on nearly all roads to connect great cities, for neither the Rail Roads nor the people would consider it desirable to have a road go near a city without going to and through it. Usually the majority of passengers and the largest quantities of freight are destined for cities. Between such points there is necessarily the most important and profitable traffic.

Unwilling Climbers.

Another reason for indirect routes lies in the fact that Rail Roads have to cross mountains. In crossing these the low points or passes have to be looked for, which may be far away from the air-line route. The air-line distance from New York to Chicago is 718

miles; the distance via the New York Central is 963 miles, and by the Pennsylvania Rail Road 909 miles.

In going from New York to Chicago via the New York Central, the passenger is only two and a half miles nearer Chicago on an air-line, after having traveled the 146 miles from New York to Albany.

At Right Angles. When traveling by the Pennsylvania Rail Road, the passenger goes first to Philadelphia, which is at a pronounced angle to the direction of his destination. When at Philadelphia, he is only 50 miles nearer to Chicago than when he left New York. Yet he has made a trip of 90 miles.

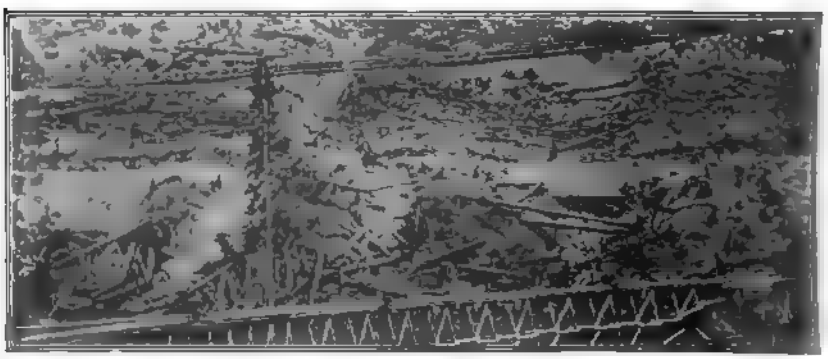
The indirectness of Rail Roads becomes still more apparent in the mileage by the several routes from New York to San Francisco. The air-line distance between these two cities is only 2,568 miles.

Transcontinental Losses. Going by the Southern Pacific Rail Road and Steamship Line, it is necessary to travel first approximately 2,000 miles by steamer, from New York to Galveston, and then the traveler is still nearly 2,000 miles from his destination. In other words, one travels 1,400 miles more than would seem to be necessary.

Using the Southern Pacific, or "Sunset Route," to California by rail, necessitates going from New York to New Orleans, 1,343 miles, from which place there is still a journey of 2,480 miles to be made to San Francisco, a total of 3,823 miles.

Zigzag. The same is true in crossing the continent by the Central Pacific. We would go from Chicago—963 miles from New York -to Omaha, a distance of 492 miles; thence to Ogden, about 1,000 miles, and then to San Francisco, approximately 786 miles more, a total of 3,241 miles.

Another route, via the Great Northern, goes to Chicago, 963 miles; north to St. Paul, 492 miles; west to Seattle, 1,828 miles, and thence south to San Francisco, 958 miles, a total of 4,241 miles.



OLD SWITCHBACK OVER THE CASCADE MTS., NOW SUPERSEDED BY TUNNELS.

Adding One-Half.

Via the Northern Pacific, one goes from New York to Chicago, 963 miles; from Chicago to St. Paul, 492 miles; from St. Paul to Portland, 2,052 miles, and from Portland to San Francisco, 772 miles, a total of 4,279 miles.

The Oregon Rail Way and Navigation Company's line goes from New York to Chicago, 963 miles; due west to Omaha, 492 miles, to Grand Junction, 854 miles; from there to Portland, 945 miles, and from Portland to San Francisco, 772 miles, or a total of 4,026 miles. As Omaha is about on the same degree of latitude as San Francisco, the trip to Portland, in order to get from the latter place to San Francisco, seems to be an entire loss. The intervening mountains, however, make it necessary to follow various devious passes.

From the North to the South.

There is still another route that is frequently used. The traveler goes from New York to Buffalo on the Canadian border, and thence, either through Canada or along the Great Lakes, to Chicago. From Chicago, the journey is made south to New Orleans, where the "Sunset Route," is taken to San Francisco. On the latter road, one is often within a stone's throw of the Mexican border. The length of the total trip is 4,355 miles.

Thus, starting from New York, one leaves the Atlantic, and in the course of the journey touches the Pacific, the Great Lakes and the Gulf, going through Canada and within a few hundred yards of the Mexican border, crossing the nation not only east and west, but also north and south.

An Unequal Burden.

It will thus be seen that some of our Rail Roads, for the purpose of getting a portion of through traffic, have to haul freight and passengers for a distance of hundreds of miles more than other roads. Yet the service by the several roads is usually given at the same rates. It will also be seen that by any of the routes from coast to coast, the distances traveled are far greater than is usually believed necessary.

That these lengthy detours are not unnecessary, is proved by the fact that Weston, the long-distance walker, who was at liberty to choose the shortest road possible, yet had to walk a distance of 3,400 miles in going across the continent.

After a consideration of these facts, can we find means by which it is possible for any commission, governing body or state regulation, to determine Rail Road rates upon a mileage basis? Under an arbitrary ruling of this nature, the Rail Road whose line to San Francisco is a thousand miles shorter than that of another company, would naturally get all the business, because its traffic would be carried for, say, 20 per cent less money.

The Final Argument.

Were we able to eliminate mountains, hills and valleys, and were all our rails level and direct, the cost of Rail Road transportation could be greatly cheapened. But until the surface of nature can be ironed out, the unevennesses must be taken into consideration as

greatly increasing distances and difficulties, tremendous factors in the cost of transportation.

Tunnels.

Tunneling may well be described as the leveling of mountains and the elimination of rivers. Through mountains of rock which would necessitate a detour of miles, or an elevation which would require many miles of line, and curves of perhaps thousands of degrees, the modern engineer bores his tunnel, in which Rail Road tracks are laid. Or, encountering a river over which a bridge is not feasible, and where a ferry will prove too costly in point of time no less than expense, the engineer turns his attention to the river bed and beneath it he tunnels, mole-like, from shore to shore.

In Ancient Days.

Tunneling is one of the oldest engineering arts. The ancient Egyptians built tunnels to their tombs or temples, and in India there are evidences of similar work. The ancient Assyrians tunneled under the Euphrates river. But first they diverted the waters of the river to another channel, making the work of tunneling much easier. For this reason theirs cannot be called a true subaqueous tunnel.

TUNNEL AND ROADBED, GT. NOR. RY.

BUILDING THE ASPEN TUNNEL, COL.

Steps of Progress.

The old Romans developed the practice of sinking shafts for the purpose of affording several points of attack to hasten the completion of the work. They also initiated the practice of building fires against the rock, heating it to the highest practical temperature, and then dashing cold water upon it. This sudden cooling cracked and disintegrated the rock.

Draining a Lake.

In order to drain Lake Fucino, the Romans constructed a tunnel three and a half miles long; 40 shafts, as well as several inclined planes, were used in driving this tunnel, the deepest shaft being 400 feet.

Not much progress was made in the art of tunneling after this period until the latter part of the seventeenth century, when the use of gunpowder enabled more rapid work through rock. The first blasting with gunpowder for the purpose of driving a tunnel ap-

pears to have been at Malpos, France, in 1679-81, on the Languedoc canal This tunnel was 510 feet long.

Canal Through a Tunnel.

In 1803, tunneling through unsubstantial material such as sand and wet ground was first attempted, when a tunnel was driven for the St. Quentin canal in France. This bore was lined with masonry.

The first tunnel constructed in the United States was on the Auburn canal at Auburn, Pa., in 1818-21. This tunnel was built by the Schuylkill Navigation Company, for the transportation of coal by water.

LIVERPOOL & MANCHESTER STATION AND CUT, 1835.

The Tunnel as a Factor in Steam Roading.

Through Rock Under Water.

The Rail Roads, in their constant onward march through all parts of the country, and to fulfill their purpose as agents of progress and development, gave a great stimulus to the construction of subsurface passages. The cost of tunnel building is one of the great items of unseen expense on the Rail Road books to-day.

The first Rail Road tunnel in this country was constructed in 1831-1833 on the Alleghany-Portage Rail Road. This tunnel was 901 feet long, 25 feet wide and 21 feet high. About that time two tunnels were built on the Liverpool & Manchester in England.

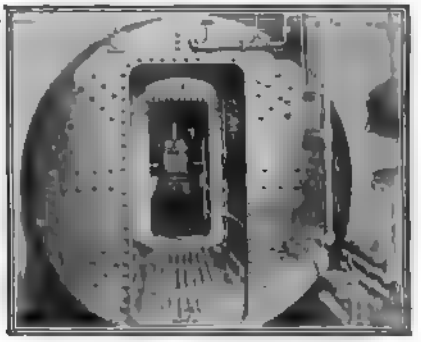
Marking an Epoch.

The Hoosac tunnel in Massachusetts, and the Mont Cenis tunnel through the Alps, were epoch-making feats. The former, four and three-quarter miles long and double-tracked, was commenced in 1854 and finished in 1876, the work having been frequently interrupted for long periods, usually on account of money giving out. The single-tracked Mt. Cenis, 7.6 miles long, was commenced in 1857 and finished in 1872.

The Bergen Hill tunnel, on the outskirts of Jersey City and a few miles from the heart of New York City, was commenced in 1855 and finished in 1861. It is less than a mile in length. The Erie has lately spent $3,000,000 in making an open cut running parallel to this tunnel. The purpose of the latter is to give passengers the additional comfort and safety of riding in the open.

A 31-Mile Bore.

The Croton aqueduct in New York is one of the longest bores through rock formation, its length being 31 miles. It is almost 14 feet wide and of the same height.



A Medical Air Lock Used in Tunnelling.

The first Rail Road tunnel under water was the one under the Severn river, England, commenced in 1873. It took 13 years to build the four and a half miles, largely through solid rock.

The St. Clair, or Sarnia International Tunnel, under the St. Clair river, connecting the United States and Canada, was built in 1890-1891 by the Grand Trunk Rail Way. It passes through a clay formation and the work was attended by many difficulties. The second international tunnel between the two countries has just been completed at Detroit, at a cost of $15,000,000.

Tying an Island to the Mainland.

The geographical isolation of Manhattan Island, on which part of New York City is situated, has been eliminated by the completion of 10 tunnels to the the mainland and 8 tunnels to Long Island, these passing under the Hudson, Harlem and East Rivers. This is the greatest aggregation of tunnels of any city in the world.

What is regarded as the greatest mountain tunneling in existence is the twelve and a quarter mile Simplon Pass tunnel in the Alps. It was commenced in 1898 and finished February 24, 1905, at a total cost of $15,700,000, or $1,308,000 per mile.

The Cost of Tunneling.

Tunneling is far from a cheap form of construction. The cheapest construction is probably $40 per lineal foot, but the cost runs up to $400 a lineal foot for double tracked tunnels. What vast sums the necessity of tunneling means in adding to construction cost, may be realized when we consider that $40 per lineal foot is almost $250,000 a mile, while $400 means almost $2,500,000 per mile. The

difference in cost lies in the varying hardness of the rock, the difficulties encountered, whether the tunnels be single or double tracked, and whether they are worked from the ends or by means of shafts.

The economy of tunneling lies in the fact that it does away with heavy grades and reduces distances, so that what may seem an unnecessarily large expenditure or extravagance is gradually made up in decreased distance, grades or operating expense.

BRIDGES.

Transcontinental Bridge Highways.

A Star Part.

The part played in the Rail Road drama by the bridge builders is little appreciated. And yet, so stupendous is the total of their labors, that it has been estimated that if all the Rail Road bridges in the United States were placed end to end, they would form a bridge that would reach from New York to Liverpool and thence to St. Petersburg, a distance of over 4,000 miles.

It is obvious that such a great mileage of bridges must represent an enormous investment, which statement is borne out by the many million-dollar Rail Road bridges over our larger rivers. The lesser rivers present obstacles only relatively smaller. In this connection, it should be remembered that there is scarcely an important river in this country not crossed by a Rail Way bridge, and some by a number of them.

Weight.

The steel used during the last decade in the construction of bridges for Rail Roads is approximately 3,000,000 tons.

While the public has little thought or realization of the bridge builders' part, the bridge builders have not been able to ignore the public. The safety of those who journey over the Steam Roads must be considered at every point, for the bridge that cannot withstand the strain or bear its burden of traffic without its safety being lessened, would fail of its purpose, causing perhaps a disaster, to the lifelong discredit of its designer and with great loss to the owner. There is ever the thought before the bridge builder, as be-

OLD RUDE BRIDGE, HEADWATERS JUNIATA RIVER, ALLEGHENY MTS.

fore all under whose care comes this part of the great Rail Road machine, that as a chain is no stronger than its weakest link, so a bridge is no stronger than its weakest member.

The Fallen Tree Trunk.

The first bridge undoubtedly was a fallen tree over some stream. Primeval man learned that it was safer than the shallow ford, which ofttimes had some treacherous hole into which he might stumble and drown. But the artificial bridge—the geometrical arch of masonry, the chain, the cable and the truss, came long after.

Corbett, an English writer, in his Gephyralogia, published at London, 1751, suggests and gives the unique explanation to the fall of Troy, that the famous wooden horse probably was simply a bridge of peculiar design or construction.

A Bridge of Boats.

The bridge of boats built by Xerxes across the almost mile-wide Hellespont undoubtedly was one of the first ever seen by Europeans. Another early bridge of boats was that of Darius Hystaspes, built in 510 B. C., to enable his army to cross the Danube.

OLD BOLLMAN IRON BRIDGE HARPER'S FERRY, NOW REPLACED.
ONE OF THE EARLIEST IRON RAILWAY BRIDGES.

Caesar's timber bridge across the Rhine, built in his expedition against the Swiss, is one of the earliest recorded, although several probably antedate it.

Trajan's bridge across the Danube, consisting of 20 arches and having a total length of 4,500 feet, and the four-arch stone bridge over the Dnieper river, built by Augustus Caesar, are other instances of early bridge construction.

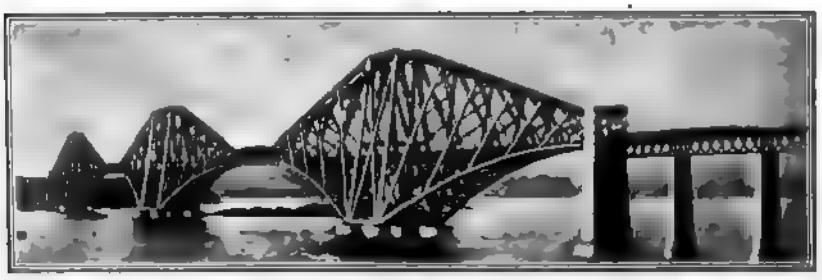
London Bridge.

In the reign of Ethelred, 994-1010, the first London bridge was constructed of timber. It was rebuilt first in 1163, and again in 1176, this time of Portland stone. The modern structure which succeeded also bears the time-honored name of London bridge.

Chain Bridges.

Turner, in the history of his embassy to Thibet, tells of chain bridges—the forerunner of the modern suspension bridge. These bridges were composed of from three to five chains, several layers of strong bamboo mats being laid on the chains as floors. They were probably preceded by bridges of raw hides, ropes and vines.

The earliest American bridges of which we have a record were those of the Peruvians, made of bejocos, which were tough, pliant, twisted vines. Others were of stone and of wood, the latter being the most common. The wooden bridge and the wooden trestle invented by Leonardo da Vinci in the sixteenth century, were developed by Americans.



THE FAMOUS FRITH OF FORTH RAILWAY BRIDGE, SCOTLAND.

American Bridges. One of the earliest important bridges in the United States—or rather in the American colonies—was built across the York river, Maine. It had a span of 270 feet. The Charlestown bridge at Boston, 1,503 feet long, with 75 piers, was built a few years later, in 1787.

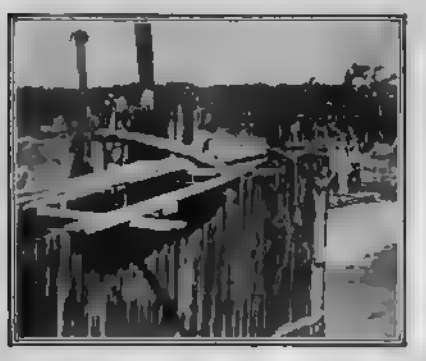
A number of suspension bridges were built about this time and found much favor. At Easton, Pa., in 1805, a bridge was built across the Delaware; the bridge had three 163-foot spans, and was one of the pioneer long-span bridges. The Colossus, built in Philadelphia, in 1812, was regarded as a wonder because it had a 340-foot span.

Spanning Niagara. The suspension Rail Way bridge across the Niagara river had a span of 821 feet; it was replaced by an arch bridge with a span of 550 feet. Other long span arch bridges are the Washington bridge, New York City, with a 510-foot span; the Lake Street bridge, Minneapolis, 456 feet; the Eads bridge, St. Louis, with three spans, the center one of 520 feet and the others of 500 feet each; the Pacific Rail Way bridge, Costa Rica, 448 feet, and the Rail Way bridge across the Viaur river, France, 721½ feet.

Details of Bridge Construction.

Down to Bed Rock. Let us consider some of the difficulties and problems of bridge building and maintenance, with particular reference to their most important use today—for the crossing of Rail Road trains, which enables the complete linking of the steel chain that binds the nation together.

In the early days of Rail Roading, and for 40 years thereafter, when bridges were almost all made of wood, the life of a bridge was only about 10 years. Even this average, however, does not include



SINKING A CAISSON FOR A BRIDGE FOUNDATION.

SOUNDING A RIVER

the frequent destruction from early bridge fires. Even the steel bridges of to-day, must be carefully guarded against burning of their wooden ties and stringers. It can easily be imagined what an enormous additional item of expense this class of bridge building meant.

The Foundation.

In the first place, a bridge, like the wise man's house, must have its foundation upon rock, if possible. In many cases this means that the foundations have to be sunk by the pneumatic process many feet below the bed of the river, the earth being removed under air pressure so as to make certain an absolutely solid foundation. This is a slow and tedious method of construction and is necessarily exceedingly expensive.

Many of our modern bridges cost approximately $500 a running foot, which is equal to over $40 an inch, or $2,640,000 a mile. Considering this, the next time you look at a great Rail Road bridge you will probably do so with respect, on the thought that it may have cost hundreds of thousands if not millions of dollars.

Dangers Incurred.

These bridges must be watched like children and, at times of floods, protected against driftwood lodging against both pier and structure. The grinding and crushing of ice against the bridge also is very dangerous. In cases of extraordinarily high waters, it is not uncommon for a Rail Road to run engines and loaded cars, representing an investment of tens of thousands of dollars, out on the bridge to weight it, so as to hold it down and keep it from being swept from its piers. But if the bridge is swept away this costly safeguard goes with it, and the loss is just so much greater.

On our older Rail Roads, there is perhaps not an important bridge, except the stone arch bridge over the Patapsco on the Baltimore & Ohio, which has not been replaced three, four, five, or in some instances, six times. There are few Rail Way bridges to-day 15 years old. A prominent bridge builder told the writer that he had replaced the same bridge in steel thrice in 20 years, to allow double tracking and because of increased weight of rolling stock.

Renewals Frequent.

Bridges were first built for the light traffic which ruled in the days of baby Rail Roads, when the limit of weight for an engine was 10 tons. These had to be renewed for the 40,000-pound vehicle, and again for 60,000, 80,000 and then 100,000 pounds; now bridges are being built with a factor of safety three and six times that maximum.

The painting of bridges must be carefully looked to and the special high grade material used, oxide, carbon or metallic paint, costs much more than ordinary grades. The quantities used make this item one of considerable moment.

Occasionally, after bridges have been in use for a considerable time, the metal is likely to corrode or crystallize, parts become weak and they have to be renewed or reinforced.

Additionally Hazardous.

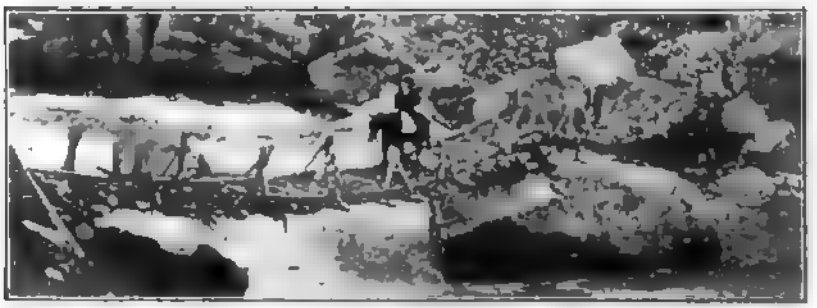
When a cloudburst or flood causes a washout on solid land, the trouble can be repaired expeditiously and without much difficulty, and the road quickly put in operation again. But the carrying away of an important bridge stops the passage of trains over the line until a temporary structure can be built. Sometimes the entire superstructure of the bridge may have to be replaced. There is not only great inconvenience to traffic, but also, possibly, loss of revenue and great damage by the delay to perishable freight.

The writer remembers being in Kansas City, when, in a single afternoon, more than half a dozen Rail Road bridges across the Kaw river were swept away by a flood, one after the other, and Kansas City was cut off from the rest of the commercial world until they were temporarily rebuilt.

Much Ado About 16 Miles.

On another occasion, the writer was on a train in the Indian territory when the discovery was made that a freight train preceding his had been wrecked on a bridge, blocking and partially destroying the structure.

The writer's train, through the courtesy of another road, was able to make a detour over that line. After traveling three-quarters of a day and covering several hundred miles, the train landed on the other side of the river bank, on the tracks of its own line, 16 miles beyond the place at which the detour had been commenced.



PRELIMINARY CABLE BRIDGE.

THE GREAT EADS BRIDGE, THE FIRST TO SPAN THE MISSISSIPPI.

Fortunes Risked.

The writer also recalls passing on a steamboat under the Eads Bridge, at St. Louis, when a high flood necessitated the suspension of traffic over it, practically isolating St. Louis. This bridge was the first to span the "Father of Waters," and link the East and the trans-Mississippi with bonds of steel. The Eads Bridge, with its adjoining terminals and yards, is valued at more than $25,000,000. The value of the Merchants Bridge, its companion at the same point, also runs into the millions.

The destruction of one of the early bridges across the Ohio River is interesting in showing the hazards of bridge construction. Practically all the steel work was up, and the structure was very near completion when the river was swollen by a raging flood. Despite the sinking of coal barges, and the taking of every other possible precaution, the flood undermined the false work and the bridge was swept into the river. Nothing remained but a mangled and tangled mass of steel and a loss of millions.

The Quebec Disaster.

The loss of the Quebec cantilever bridge, which involved millions, is so fresh in the public mind that no reminder of it is necessary. This disaster aroused interest in many circles, and did much to illustrate the cost and risks of bridge building.

Nearly all modern Rail Road bridges have guard rails, so that in case of derailment, the trucks, not being able to turn crosswise, are kept in line and on the structure.

Masonry Viaducts.

The Pennsylvania Rail Road, in its method of bridge construction, probably the most advanced in the United States, has gone back to one of the first principles in construction -the stone arch bridge. It has recently taken out its steel bridges across the Delaware, the Upper Susquehanna, the Raritan and over other rivers and streams, and replaced them with masonry viaducts.

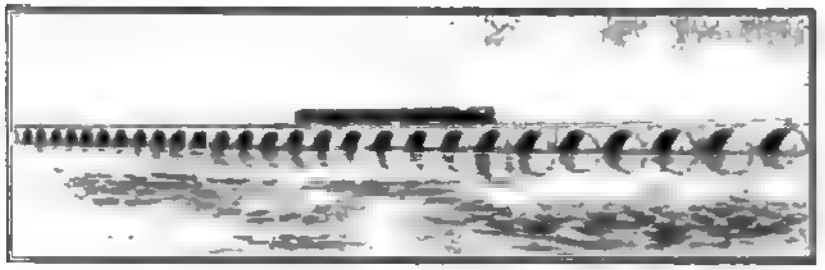
These practically give a permanent roadbed as firm and substantial as that upon the land, which will probably outlast many

generations of men. The only halt to their usefulness will be unexpected increases in the size of Rail Road equipment. They, however, have been built at great expense, and one that Rail Ways with only average traffic and resources could not afford.

The Ideal Present.

One can now go from coast to coast as though no rivers existed. The modern bridge is the Moses which enables us to cross the waters dry shod. What would we do if we had to go back to early times, when every stream was an obstacle requiring freight carriers either to ferry or ford, or to break bulk in order to ship produce or merchandise across it? We might imagine our state of mind if we were in a passenger train and had to alight at each river, wade or ferry across and then take another train.

We can appreciate what hardships such a condition would entail, the inconvenience to the passengers, the increase which would result in the cost of freighting, and the setback it would give to progress and prosperity.



A WELCOME RAILROAD OVER THE FLORIDA KEYS AND INLETS, FLA. E. COAST RY.

FREIGHT YARDS AND CARS INVOLVE AN ENORMOUS OUTLAY.

SECTION XXXVI.

SOME OF THE AUXILIARY MACHINERY OF PROGRESS AND PROSPERITY.

Second and Side Tracks—The Limitations of a Rail Road.

A single track Rail Road may be compared with a narrow, raised platform, or a narrow plank across a stream, only wide enough to pass one person at a time. In such a case, when two persons meet, one must give way and go back, thrust the other off, or both must stand uselessly, aimlessly and endlessly still. Turn-outs, however, would make it possible for them to pass.

An Analogy. Instead of individuals or persons meeting on the platform, suppose they come in many groups of five, ten or even fifty at a time. In that case turn-outs, unless they be extraordinarily large, will not accommodate them. In order to obviate this, there must be parallel platforms, which might be said to compare with a double track Rail Road.

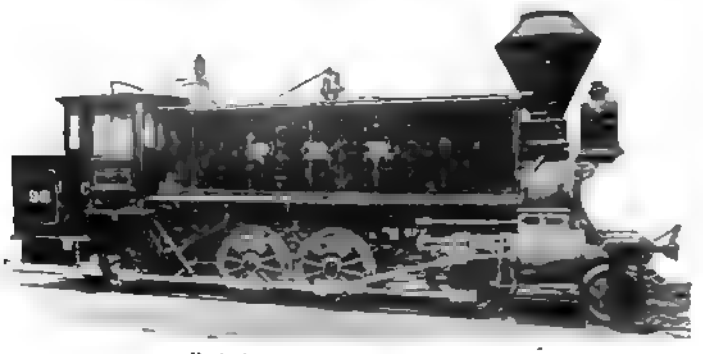
Suppose that the persons on one platform go in one direction, and those on the other in the opposite direction. Let us imagine

that some walk and others are in a hurry and run at top speed; there would again be blockades and jams.

Each Track a Unit.

In the same way, double tracking helps but little on a Rail Road where much freight and passenger business moves, even in the same direction but at widely different speeds, on the same track. We are again reduced to our single platform illustration and the same necessity for side tracks and turnouts.

The limitations under which Rail Roads worked before the introduction of side tracks and the limitations under which they would still operate without this necessary part of their plant, are graphically and amusingly illustrated by a description of early conditions on that part of what is now the Pennsylvania Rail Road system which was built by the state, the Philadelphia and Columbia.



PENNSYLVANIA SWITCHING ENGINE.

Absence of Side Tracks.

In the earlier days, this Rail Road had no turnouts or side tracks to enable one train or car to pass another. Fortunately the Philadelphia and Columbia was a double track road, as were all Steam Roads in that day, or it could have been operated only intermittently in one direction at a time. As it was, one track was operated in one direction, and one in the other.

The first man to start at one end of the line had necessarily to be the first to reach the other end. Thus the slowest ruled the speed of all who followed.

First Come, First Served.

A farmer would go out on his journey with a ramshackle car containing a nominal load, and with a couple of bags of skin and bones in the way of horse power, on which might appropriately be displayed a placard reading "Corn wanted—Inquire within." Whenever the farmer thought it necessary or desirable to repair his vehicle, water his horses, pick tempting berries in neighboring fields or amuse himself generally, he would stop his car and block the road.

Another car might follow him, or even a train drawn by an engine capable of making comparatively fast time, the passengers whereof could break the Third Commandment and overwork the

Recording Angel to their heart's content, without being able to hasten their own rate of progress, or disturb the farmer's equanimity.

Rail Road Teamsters.

Operating companies owning horses and cars, ran them over the lines of this and other Rail Roads in Pennsylvania and elsewhere to carry goods for those not owning such rolling stock. Their teamsters were akin in language and habits to, and were direct ancestors of the genus teamster of to-day, among whom parliamentary language is an unknown art, and before whose politest expressions the most forceful language of the fo'castle would pale and slink into hiding.

These teamsters were an unruly lot, stubborn as the mules they drove, and as ready for hostilities as a bulldog. They could never be induced to start out at the same time or to feed and water their horses at the same place, for each one was a law unto himself, with a result, so far as order, utility and operation were concerned, which can be better imagined than described.

As You Like It.

The Rail Roads were without stations or depots in those days. The inns, as in the days of stage coaches, were the stopping places. These stopping places were always made use of for refreshments, frequently of the spirituous kind. Such conviviality is seldom conducive to progress.

Yet the jarring results of these conditions could have been done away with to a great extent if the road had had side tracks, because the teams could have left the main line when making their stops, and elsewhere allowed more rapidly moving vehicles to pass.

The Uses of Side Tracks.

The Rail Road's Fifth Wheel.

The side track is as essential to a Rail Road as a fifth wheel to a wagon. Without the fifth wheel and the ability to turn to one side, the vehicle could run only on an absolutely straight road, and would not be able to turn a sharp corner, get out of the way of or pass other wagons going the same way or in an opposite direction.

Practically all roads have freight and passenger trains, the former moving slower than the latter; hence a road must have side tracks on which a slow train may turn out to allow the fast one to pass.

Single Track Rail Roads.

Single tracked roads compose six-sevenths of all our lines. Trains on such lines could no more go in opposite directions without side tracks than two steamships could cross in a channel only wide enough for one. Hence the absolute necessity of sidings, which are as essential to the Rail Road as the wharf to the steamboat for loading and unloading.

If a steam road had no side tracks, business would be practically suspended wherever the loading and unloading of a car or a train load of freight were going on, as it would block all movement.

In order that those trains having the terminal of the line as their destination might be able to reach it, all preceding trains would be compelled to run to the end also; consequently there could be no locals, or if there were locals, there could be no through fast trains. All return trips would have to be made with the engine running backward, pushing the train before it. Such conditions are practically impossible.

A Demand of Commerce.

As the nation grows and progresses, its increasing traffic is diverted to our modern transportation agents. As the steam road's business grows, side tracks become ever more necessary and more and more of them must be added. The occasional side tracks are lengthened and multiplied until they finally form a second track, allowing trains going in opposite directions to operate continuously, and then side tracks are added to these.

ELEVATING TRACKS INTO CHICAGO, OLD AND NEW LOCATION.

PRAIRIE SECTION, MAIN LINE, U. P.

Side Tracks on Double Track Lines.

Never Superfluous.

Side tracks for all practical purposes are necessary on double-tracked roads to allow fast trains to pass the slower ones, and to allow freight trains to stand aside and load or unload while the passenger and perishable freight trains are rushed forward.

When a train or engine is disabled, it is gotten out of the way by means of a side track, otherwise it would block the train movement of the road. But a still more important function of side and yard tracks is their use to hold, shift and transfer cars and make up trains for loading and unloading.

50 Per Cent Side Tracks.

The result of this growing necessity for all these purposes is that to-day there are 196,000 miles of second, third, fourth, side and yard tracks, almost half a mile for every mile of main track in the country. Even this large amount is insufficient in busy times, and we must constantly have more, as it must be remembered Rail Roading consists not alone in transporting but that it means handling, receiving and delivering goods.

Expense High. The cost of the subsidiary or side track very frequently amounts to as much per mile as the main track. After the main line has been constructed surrounding property values increase, and the additional lands for subsequent side or second tracks are difficult and costly to secure, particularly in cities and towns, where they are principally located The grading is also frequently very expensive.

Railway entrance into Manchester, Eng., 1835

TERMINAL, JUNCTION, AND SHIFTING TRACKS.

A Cause of Delay. Notwithstanding the ample provision of side and yard trackage, one of the greatest causes of delay to freight to-day is the detention for redistribution of trains, cars, and freight in small lots at terminals, and the shifting of cars from one road to another at junction points. We have spoken elsewhere of the tremendous expenditures which have been made for classification yards to save part of the train movement at the end of the line.

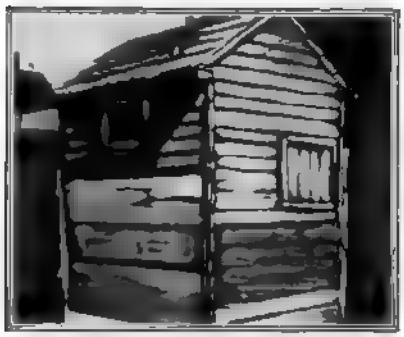
Greenville Terminal. It has been found that the freight terminal tracks are inadequate for the large and ever growing traffic of the nation. To relieve these conditions great improvements and additions are being made. The Pennsylvania, for instance, at an enormous expense, has filled in a part of New York harbor, covering hundreds of acres, to provide room for the new Greenville terminal, whose tracks will hold more than 20 miles of trains.

The Southern and the St. Louis & San Francisco spent millions to enable them to handle their terminal business at New Orleans. Hundreds of other examples might be given. Nearly every road in the country is making expenditures of the same character and of proportionately the same magnitude. Other millions will have to be expended in almost every traffic center of the nation, to prevent

congestion. These expenditures are almost entirely unrealized except by those engaged in making the improvements.

As Many Yard as Line Engines.

To bring one to a realization of the magnitude of the work done in the Rail Road yards, it is only necessary to state that on the last division of the Great Northern Rail Way 27 engines are required to bring in the freight; substantially the same number are necessary to handle the freight cars after they arrive in the yards of the twin cities of St. Paul and Minneapolis.



THE FIRST RAILROAD TICKET OFFICE, DELAWARE, NEWCASTLE AND FRENCHTOWN RY

OLD PENN STATION, PHILA., INTERESTING TO COMPARE WITH THE MODERN STATIONS FOLLOWING.

Passenger Terminals.

The Pennsylvania Rail Road has just completed a great passenger terminal in the heart of New York City. The cost of this terminal with its real estate and yards at both ends of the tunnels extending east and west, is placed at $120,000,000. It will accommodate 1,450 trains and be able to handle 500,000 passengers a day, or do the apparently impossible work of emptying Manhattan Island of people in less than six days.

28 Acres.

Twenty-eight acres in the heart of New York City are enclosed by the retaining walls of the terminal, their total length being 7,800 feet, a mile and a half. The ground taken for this purpose necessitated tearing away 500 large buildings and apartment houses and the dispersal of a population equal to that of a good sized city.

The dimensions of these buildings are such that they need not be described in feet, as is usual when speaking of such structures. In this case, it is quite as convenient to give them in the larger unit —the yard.

Size of Building.

The structure, or station proper, is 260 yards long, 144 yards wide and 51 yards in maximum height above the street. The building covers eight acres, and as there are a number of levels, this extent is increased several times. The main waiting room is nearly 100 yards long, 34 yards wide and 50 yards high, while the concourse is 113 yards long and 70 yards wide.

There are 25 baggage and parcel elevators and 11 passenger platforms, with a total length of four miles.

The general waiting room is the largest of its kind in the world. It is 107 yards in length, 106 yards wide, and 50 yards high. The Long Island City yards of the terminal will have 70 miles of trackage, and the New Jersey yards at Manhattan many miles more.

Water Terminals.

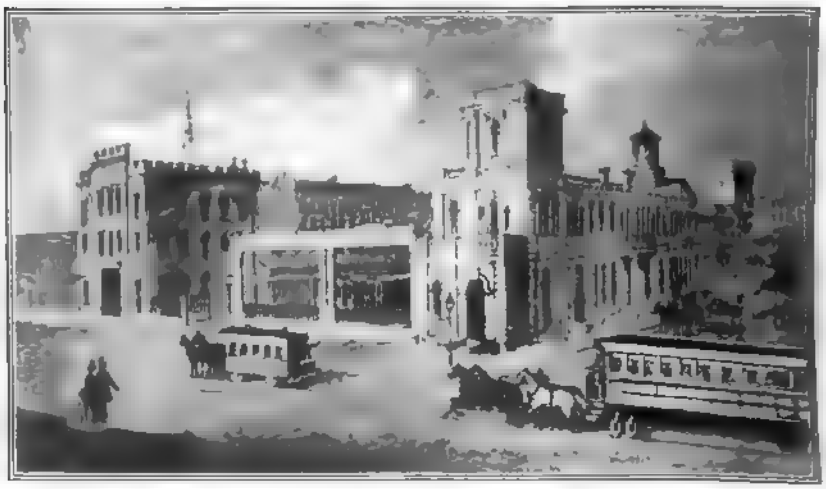
The Pennsylvania also maintained ferry facilities from its Jersey City terminals to three points in Manhattan and to one in Brooklyn. In 1904, Prof. Henry C. Adams, acting for the United States census bureau, estimated the value of these terminal properties at $5,698,000.

The various Rail Roads, with terminals at and ferry connections from Jersey City, own 600 acres of upland and 600 acres of submerged lands on the shore line of Hudson County, all in or near Jersey City. The value of Rail Road real estate in New Jersey, as related in our section, "Over-capitalization," is $230,000,000.

The Assessors' Tribute.

In something like 20 years the Pennsylvania Rail Road has had to reconstruct, enlarge and rearrange its terminals at Jersey City three times, owing to the immense and constantly increasing volume of traffic. Its passenger terminal at Philadelphia was built comparatively only a few years ago, at an expenditure of millions, and was supposed to be big enough for all time. It is 16 tracks wide, but it is expected that it will shortly be necessary to widen it to 27 tracks.

This will necessitate the purchase of a number of city blocks, and the closing of several streets, in a busy part of the city, at a cost of many more millions. There are going into and out of this station daily some 700 trains; including the trains being made up



RAILWAY CAR HAULED BY HORSES INTO FOURTH AVE. RAILWAY DEPOT, NOW SITE OF MADISON SQUARE GARDEN, N. Y.

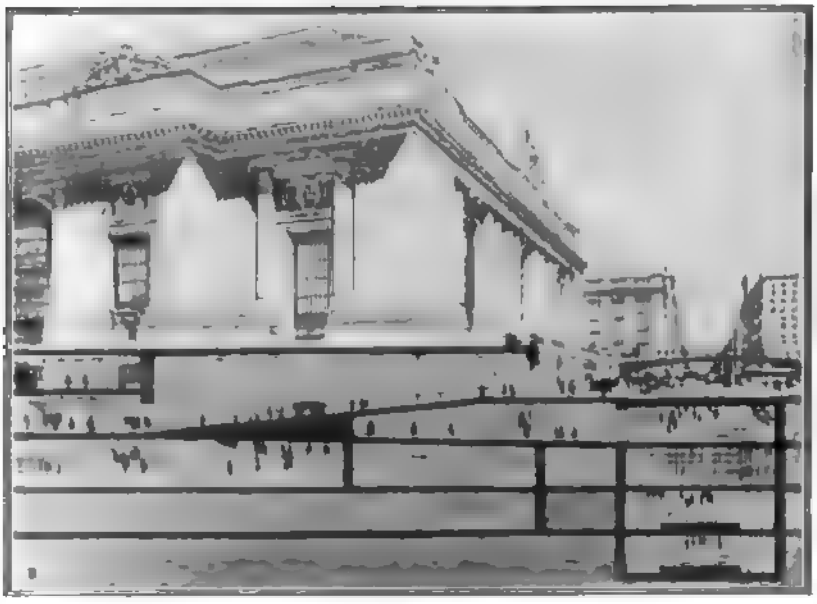
PENN. LATER BROAD ST. STATION, PHILA. PRESENT PENN. BROAD ST. STATION, PHILA.

and the shifting of trains, there is an average train movement each minute from five in the morning to twelve midnight every day.

Some Magnificent Structures.

The Central's Improvement. The New York Central, which a few years ago rebuilt the Grand Central Depot in New York at large expense, is now tearing down this modern building, eight stories high, with a frontage on two streets of nearly a quarter of a mile.

There was very little storage capacity in the vicinity of this depot in which to accommodate the cars between the time of arrival and departure. Consequently the terminal tracks leading into



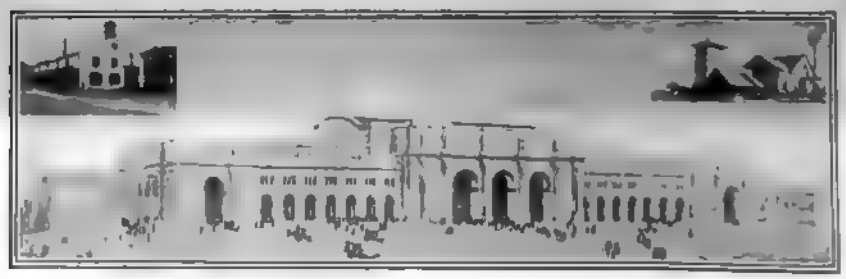
[illegible] FOUR UNDERGROUND AND TWO OVERGROUND LEVELS OF RAIL-[illegible] N. Y. CENTRAL STATION, N. Y.

the station were terribly overcrowded. Most of the trains had to be run five miles away to the Bronx, to be cleaned, stored and made up.

180 Million Dollars.

The new Grand Central plans call for the usage of 17 city blocks in one of the most expensive sections of New York City. To build and complete this station as laid out, with the buildings contemplated, the New York Central will have to dig $180,000,000 from its sources of credit. About $50,000,000 of this is the cost of additional land. The new depot will be the biggest in the world. Forty tracks will be used for the express service and 22 for the suburban service, giving it greater trackage than any other passenger station in existence. The tracks will all be on two stories, both beneath the surface of the ground.

The present terminal in one year handled 20,000,000 passengers. Exclusive of work trains, 177,802 passenger, mail and express trains annually—593 every business day—of a total length of 14,143 miles, sufficient to make almost six solid air-line transcontinental trains, came to and went from this station in 1909 without accident. The complete destruction of the old and the construction of the new station while operation was continued, created many new dangers, greatly increased the expense, and make this record all the more remarkable.



New Union Station, and old B. & O Stations, Washington, D. C

Terminals of Other Roads.

The Lackawanna and Erie have made vast expenditures for the improvements and additions to their terminals in Hoboken and Jersey City, for both freight and passengers, the former having built an entirely new and magnificent station.

A number of our Rail Way stations are to-day, and will continue to be classed among the most majestic and superb architectural features and improvements on earth. The Union Station at St. Louis is said by architects to be one of the most magnificent and perfectly proportioned buildings of modern times.

Magnificent Architecture.

The decorations of the new station of the Delaware, Lackawanna and Western at Scranton—a minor city—are of dignified magnificence and richness, and include a collection of rare onyx, marbles and woods that would fittingly adorn the palace of the proudest monarch.

The new Rail Road terminal in Washington, which has cost about $12,000,000, exclusive of the cost of yards and tracks, and $28,000,000 with them, is scarcely second to any building in the United States, with the exception perhaps of the New York terminals of the Pennsylvania and New York Central.

It is hard to find anything that could be more illustrative of the development of the Rail Road industry than comparisons of the size, convenience, architecture and cost of the early and modern Rail Way stations.

Public Convenience.

The modern stations, even in our smaller cities, are not only architectural gems, but a rare combination of comfort and convenience. They contain toilets, lunch rooms, smoking rooms, retiring rooms and many public conveniences, installed as handsomely and elaborately as in the most palatial hotels.

The North and South stations in Boston, the Mt. Royal and new Union stations in Baltimore, the Michigan Central, Lake Shore and other stations in Chicago, the Union station in Omaha, the new stations in Atlanta, Birmingham, Knoxville, Fort Worth and hundreds of other cities, are splendid examples of Steam Road architecture and show how modern public carriers lead the march of progress and from their resources provide for the wants of the public in a splendid way.

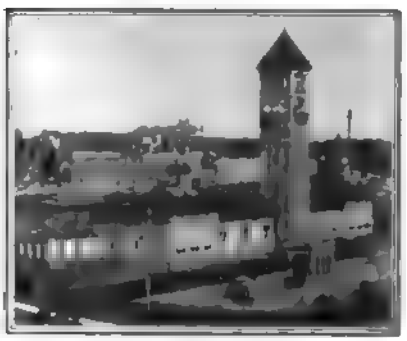
Many Benefit.

More attractive stations and yards are being erected than ever before, and wherever there is now an old station, the growth of traffic and public sentiment unite in demanding its replacement, even in villages.

Despite all these facilities, congestion will still occur in busy times. The congestion of a Rail Road yard may be compared with the condition of a person who has pneumonia—breathing cannot be carried on freely, and every vital organ feels the effect.

An Important Position.

Accident and delay on the main line are serious. In the yard they are disastrous. The terminals and yard facilities offered by our Rail Roads are among the most important factors of modern transportation, and are an excellent gauge of our progress and prosperity.



B. & O. Station, Baltimore.

La Salle Station, Chicago.

THE VALUE OF RAIL ROAD RIGHT OF WAY.

A computation of the value of the rights of way of Rail Roads in the United States will bring to view a total value of such magnitude as almost to challenge belief. Although it is difficult to figure the exact value of 342,000 miles of land of varying width, usually located in the heart of the best sections of the nation, it is believed possible to make a reasonable approximation.

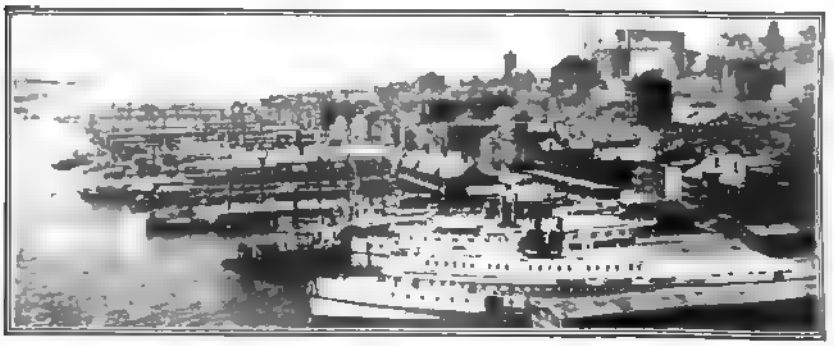
Oaks from Little Acorns.

The area of the Rail Road rights of way, on the basis of 12 acres to the mile, approximates 4,080,000 acres, equivalent to the combined areas of the District of Columbia, the states of Rhode Island and Delaware, and three-fifths of Connecticut.

It may be of moment, when next the question of Rail Road values arises, to think of the offset to capitalization which such large real estate holdings represent, especially as large tracts displace farm lands worth from $75 to $100 an acre, while much of it is in more costly sections of villages, towns and cities, rising in value to many times these sums.

Kingdoms for the Iron Horse.

Some years ago the value of the right of way was estimated as averaging about $9,000 a mile, or $3,078,000,000. Probably a more correct estimate today would be on a basis of $10,000 a mile, representing a total valuation of about $3,420,000,000.



EAST RIVER WATER FRONT AND WHARVES FROM BROOKLYN BRIDGE.

Most of our important Rail Roads were built when land was comparatively cheap; property which was then low in value has since enhanced greatly, to a large extent because of their presence, no less than because of general increase in land and other values.

Four Millions Per Mile.

The New York, New Haven and Hartford Rail Road, which enters New York City over the tracks of the New York and Harlem Rail Road, pays about $1,000,000 a year as rental for partial use of 12 miles of track, over which it runs its own equipment with its own

power from Woodlawn to the Grand Central depot. It is easy to see how enormous must be the value of the land bringing in such an annual rental. Capitalizing its partial use at 4 per cent, gives it a value of $25,000,000. As the New Haven does less than half the business passing over the track, the 12 miles might properly be capitalized at $50,000,000.

In Chicago, the value of terminals, because of expensive real estate, is so large that most of the roads secure passenger trackage rights to one of the six great passenger stations, paying heavy rentals for the privilege. Thirty-four Rail Roads enter Chicago, only one in six, therefore, using its own passenger depot, although nearly all have their own freight yards and terminals. The Wabash is now proposing a new terminal, to be built and used by several roads, to cost $100,000,000.

Four Millions an Acre.

A valuation of more than $4,000,000 an acre has been put on one piece of real estate held in Chicago by Rail Roads, and one terminal occupies property which, on the basis of official valuation of adjoining property, is worth in excess of $1,000,000 an acre.

In 1907, the Chicago and Northwestern paid $50,000 for a plot of land 80 by 80 feet, or nearly $8 a square foot. The same company recently purchased 28,000 square feet of land for $365,000 or $13 per square foot—$566,000 an acre. At this rate a full right of way 100 feet wide would cost $6,864,000 a mile.

Startling Prices.

The Atchison, Topeka & Santa Fe some years ago, sold 2.12 miles of right of way in Chicago, for $8,000,000 cash. The right of way and real estate holdings on the lake front of the Michigan Central and the Illinois Central are almost priceless to-day.

In Chicago, there are about 800 miles of main track and 1,400 miles of secondary track, or enough within the corporate limits of the city to cover the air line between New York and San Francisco, leaving a gap of only 300 miles. The main line occupies 9,600 acres, to say nothing of what is occupied by the 1,400 miles of secondary track. According to the assessed values, a mile of Chicago right of way is worth about $144,000.

The Value of Each Foot.

The census bureau estimates "the true value of real estate and improvements exclusive of Rail Roads and telegraph and telephone systems," in the District of Columbia at $21,620 an acre. The 12 acres necessary to a full width mile of right of way would, therefore, cost $259,440, while the value of the 31 line miles now operated in Washington would be $8,042,640, which is actually much less than the value of Rail Way realty holdings in that city.

Striking variations are found between the values of right of way in thickly and sparsely settled sections of the country. In Rhode Island, with 420 inhabitants to the square mile, the valuation of Rail Road right of way is placed at $137,966 a mile, while it is given as an average of but $313 in Nevada, where there is less than one person to the square mile.

Rights of Way Costly.

It seems that Steam Roads are usually forced to pay liberally for property taken. The Rail Road commission of Wisconsin estimates that the value of right of way, yards and terminals, should be figured at two and one-half times the price of adjacent real estate.

In a Western state, having at the time an average population of two and one-half persons to the square mile, $898 per mile was paid, not long ago, for right of way through four counties. In another Western state, with a population of 24 per square mile, the right of way through two rural counties cost the Rail Road $1,700 per mile. In a county with a population of 112 to the square mile, $18,950 was paid for right of way reaching to the outskirts of a large city.

Recently an Illinois road, which for the past 10 years had paid about $75 an acre, or less than $1,000 a mile, for its way lands, found it necessary to purchase a narrow strip a mile long and 66 feet wide across a 185-acre tract in the outskirts of Chicago.

Paying Land Damages.

The eight acres bought cost the Rail Road $12,000; for damages to the rest of the tract the road paid $18,000; then it was forced to buy land for a new street through the tract at the same price it paid for the right of way, and to pay for the improvements of the street. The total cost in order to secure the necessary eight acres was $6,631 an acre, although the land used was valued at only $1,500 an acre.

A Million for Three Miles.

Another instance of the valuation of land thus used is found in the recent foreclosure sale of Rail Road property belonging to the Wheeling Terminal Rail Way, a bridge and 10 miles of terminal track at Wheeling, W. Va., being valued at $362,694 per mile.

It should be remembered that the Rail Roads have large real estate holdings not covered by tracks, land which strictly speaking, does not come under the head of right of way. On these are located their freight sheds, cattle pens, machine and repair shops, passenger stations, lumber yards, grain elevators, coal storage and locomotive coaling plants, round houses, section houses, office buildings and the many other structures necessary to the operation of a Rail Road, mentioned in our article on buildings in "Spending for Upkeep."

The three terminals at Atlanta, Birmingham and Brunswick cost the Atlanta, Birmingham & Atlantic about $7,500,000.

Further, they necessarily have considerable holdings unimproved, acquired to provide or to protect themselves for future improvements and extensions or additions to terminals, trackage buildings, etc.

Increase for All

Rail Way rights of way have increased in value from year to year as have adjacent values. Real estate and other property increases in value with increased prosperity and growth of population. There has been, without doubt, added prosperity throughout the land, and it is

therefore obvious that the Rail Roads, often the source of such wealth, must have increased in value also.

In one year the assessed valuation of real estate in New York City has been increased $1,000,000,000. The assessed valuation of the state is 112 per cent above that of ten years ago. Substantially the same is true in many other cities and states.

The matter is practically summed up by the Wisconsin Rail Road Commission, a body owing its appointment to Senator La Follette, which says:

A Natural Right.

"The owners of Rail Road property are entitled to any increase in the value of their property that may accrue from the progress of the territory in which it lies, and they have as much right to their natural increment in the physical value of their property as the owners of any other property."

While $10,000 a mile may seem a substantial price, it should be remembered that after all, it is but $2 a running foot for the entire right of way. As we say in our "Analysis of a Rail Road," it would be difficult to duplicate the right of way of all the Rail Roads in the United States, often 100 feet wide, running through country, villages, towns and cities, for one dollar and eighty-nine cents per running foot.

UNLOADING LAKE VESSELS INTO RAILWAY CARS.
THIS PLANT ALONE IS WORTH $500,000

THE RAIL WAY NAVY OF THE UNITED STATES.

Few of us realize the great magnitude of the expense in the operation of most of our larger Rail Roads which is caused by the maintenance of an auxiliary navy of greater or lesser proportions.

Floating Equipment.

The transcontinental Rail Roads, the trunk lines, and those which have terminals at ocean ports or lake fronts, often find the expenditure for the purchase or rent of wharves and floating equipment a serious drain on their purses.

Frequently it costs up to 22 cents a ton for wharf charges, or 20 per cent of the average compensation to the Rail Road for hauling a ton of freight.

The operation of the marine departments of Rail Roads required an expenditure of $11,500,000 in a single year, while the renewals and repairs of the docks, wharves and equipment, cost a total of practically $19,000,000. The expenditures of the subsidiary steamship lines probably add $30,000,000 to this, bringing the total outlay for the Rail Road navy to $60,000,000 a year.

Many Navies.

The Erie Rail Road Company has a fleet of 400 vessels, the Lehigh Valley of 261, the New Haven of 79, the Lackawanna of 216, and the Pennsylvania of 382. The New York Central has 220 in New York harbor alone.

These six roads, therefore, have a total of 1,558 boats; the Jersey Central, Baltimore & Ohio and Reading have at least 500 more, so it is safe to say that the Rail Road craft of various kinds entering around New York harbor alone number 2,000, while in the navy of the United States there are only 292 seaworthy vessels—about one-seventh as many.

ORE DOCKS DULUTH FROM RAILWAY CARS INTO VESSELS.

Scattered Fleets.

Philadelphia, Boston, Baltimore, Norfolk, Savannah, New Orleans, Galveston, San Francisco, Puget Sound, Chicago and the Great Lakes swell the total of Rail Road vessels to a very much larger number. Many of the craft used in and out of New York, Baltimore and Hampton Roads harbors are coal barges, used to cheapen the cost of coal transportation between the mines of Pennsylvania, Virginia and West Virginia and the factories of New England, for our Steam Roads do not scorn to use water when it is economical or beneficial to commerce.

The many classes into which the floating equipment is divided is indicated by the list of the New York harbor fleet of the New York Central lines. The 220 boats are divided as follows:

Ships of the Line.

Seven steam passenger ferry boats, 21 steam tug boats, 59 car floats (capacity from 8 to 17 cars), 6 freight propellers, 107 barges or lighters, and 10 grain boats for carrying grain in bulk.

There are 9,139 men directly employed in the marine service

who receive a total of over $6,000,000 a year in wages. The steamship companies operated by the Rail Roads employ at least 5,000 more. The total of 14,000 men compares more than favorably with the 13,000 men in the Austro-Hungarian navy.

A Losing Venture.

It would appear that the marine department is not always profitable, for even excluding the cost of repairs and renewals, we find that the Erie's income from water routes is $2,143,218, while operating expenses are $119,000 more.

DUMPING A CARLOAD OF COAL INTO A COAL BARGE.

GREAT NOR. STEAMSHIP, THE "MINNESOTA," AT SEATTLE.

The Lake Fleet.

Nearly every great Steam Road line out of New York to Buffalo owns its own line of lake vessels, which run in connection with it. The rail and lake route thus established enables cheaper transportation for goods not requiring very quick dispatch, in those seasons in which the lakes are open for traffic. The splendid fleet in this service would offer an imposing sight if gotten together.

Weather Limitations.

Unfortunately, the lake fleets are laid up in the winter, when these vast bodies of water are frozen over. It is then that we most realize the convenience of modern land transportation, for the Steam Road is free from such weather limitations.

The car ferry of the Mackinac Line forms an almost direct link from St. Ignace to Milwaukee, a distance of about 60 miles, the ice breakers defying all winter conditions.

A Large Fleet.

The Bessemer and Lake Erie has a line of magnificent ore and coal boats, numbering 175 vessels. From Galveston and New Orleans come as fine a fleet of coastwise steamships as ply any similar waters. The Morgan line of steamships enables direct ocean connection of these ports with New York and New England points.

Land and Water.

The Savannah Line is run in connection with the Central Rail Road of Georgia and the Brunswick Line is operated as the water connection of the Atlanta, Birmingham & Atlantic Rail Way.

The Florida East Coast line has an ocean extension by steamer to Nassau and Cuba, and will soon have a line of car ferry-boats from Key West to Havana. One may then enter a Pullman car in Havana and not leave it until New York is reached. This will be an ocean Rail Way in fact as well as in phrase.

Famous Vessels.

The New York, New Haven & Hartford controls the New England Navigation Company and operates in connection with the Rail Road such famous passenger steamers as the Commonwealth, Pilgrim, Priscilla, Puritan, etc., pictures of which are given elsewhere.

The vessels this company owns are capable of transporting 20,000 passengers and of carrying 2,700 car loads of freight at a time, and the car floats of the New Haven Rail Road can keep 2,000 cars on the water at a time. The different lines also render service for the public direct.

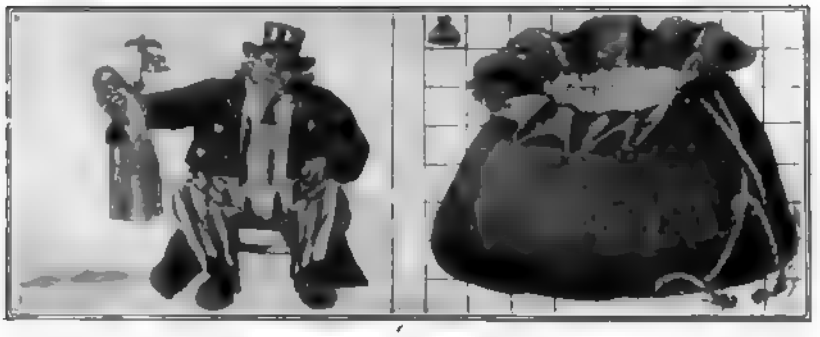
To the Orient.

The Great Northern, Northern Pacific, Union Pacific and Canadian Pacific lines of steamships to the Orient are also important. The steamships Northwest and Northland of the Great Northern Rail Way are superb vessels, and about as large as many of the Atlantic steamships, yet they ply only on our Great Lakes.

There are other Rail Roads owning splendid vessels and maintaining excellent water services, the Pennsylvania, for instance, having many steamboats on Chesapeake Bay, and reaching points not touched by rail, but even the few details given here serve to show how extensive is this department, though playing so modest a part compared with the transportation service rendered by the iron horse.

THE COST OF HOTELS: $1,000 YESTERDAY, $1,000,000 TO-DAY

MODERN HOTELS AND THEIR ASSESSED VALUATIONS



THE UNITED STATES IS TEN TIMES AS GREAT IN POPULATION AS IN 1820

IT HAS SEVENTY-TWO TIMES THE WEALTH OF 1820

SECTION XXXVII.

A STORY OF REAL PROGRESS AND PROSPERITY.

THE LITTLE UNITED STATES 1820 THE GREAT UNITED STATES 1910

The Growth of the American Commonwealths.

The census of 1820, the last period prior to the introduction of modern land transportation in the United States, gives some interesting facts in regard to the status of the nation then, and affords many startling comparisons with the wonderful progress accomplished and the prosperity existing now.

A Wonderful Chapter.

The story of the progress and prosperity that followed the building of Rail Roads in the different sections of what are now in fact as well as name the United States, forms the most interesting chapter of our history

We have traced the story of the physical construction of the Steam Roads, the obstacles they encounter and overcome, of prairies and deserts crossed, of rivers spanned and of mountains climbed and pierced

What Followed. But even more interesting is the development which followed the resistless advance of the steel road and the iron horse; how they gained mile after mile upon the retreating wilderness, until the day came when the wilderness had vanished.

The marvelous development may be likened to some fairy tale, or a story from the Arabian Nights, for the Railed Roads have indeed proved to be the veritable genii of Aladdin's lamp to this young giant of a nation. Wherever they touched the soil there sprang forth cities more magnificent and fields richer than those conjured by the wildest fancy of the imaginative East, compared with which cities even Bagdad and Damascus were mere villages.

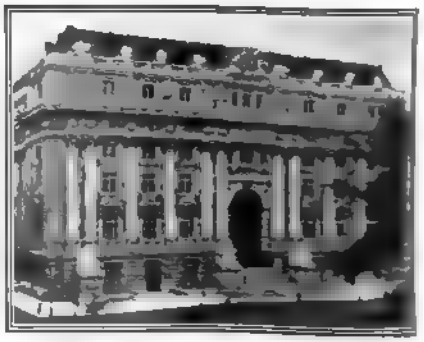
Fact. The stupendous wealth that has been brought forth from mine, field and forest, is the stubborn proof that our nation's fairy tale is fact.

In considering what we record below it should be remembered that the nation did not spring into existence at the time for which the earlier figures are given, but that the foundations had been laid two centuries before, that the nation as such was half a century old, and that industries had sprung up and taken root. This fact only accentuates the wonderful effect that improved or Steam Roads have had on our progress and prosperity, for it proves how rapid has been the advance since their advent.

Fascinating Figures. In the year of the census immediately preceding the beginning of Rail Road building the United States had a population of something over 9,000,000; in 1910, the population was 91,775,000, so that we now have over 1,000 per cent of our population of 90 years ago.

Wealth. The United States made no estimate of its wealth until 1850, more than 20 years after the introduction of Rail Ways, when it was $7,135,000,000, but an approximation in 1820 would probably have shown $2,000,000,000 as being our total wealth at that time. For 1910 it is estimated at $130,000,000,000, which means that the 1820 wealth of the nation has been duplicated every 17 months.

OLD N. Y. CUSTOM HOUSE 1825.



PRESENT CUSTOM HOUSE, 1910.

THE CONTRAST IN SAVINGS DEPOSITS AND DEPOSITORS, 1820—1910. DEPOSITORS INCREASED 1,000 FOLD, EACH AVERAGE DEPOSIT TRIPLED.

The wealth per capita, estimated to have been $200 in 1820—$1,000 per family—has since increased to about $1,400, or $6,580 per family.

Savings Bank Deposits.

In 1820, the total deposits in the savings banks of the United States were $1,138,576. In 1910 the deposits of our savings banks and in the savings departments of other institutions and trust companies, exceeded $5,670,000,000; or, the people of the nation have put down into their stockings in each period of less than six days an amount equal to the total deposits 44 years after the nation declared itself free. In 1820 the average deposit was $131; in 1910 it was $430.

The Poor Richer.

The number of savings bank depositors has increased from a meager 8,635 to a vast army of 9,142,908; including the depositors in the savings departments of other institutions, there are to-day 15,150,000 savings accounts, a total growth of 175,000 per cent. In the year 1820, not one out of a thousand people in the nation had a savings bank account; to-day almost one out of six men, women and children, has a savings bank account. Since 1906, the 8,635 depositors of 1820 have been added to the already immense total every two weeks.

The 1820 total of bank deposits is unknown, but was probably only a comparatively few millions. The deposits in 1909 aggregated $14,000,000,000. The resources of our banks are to-day $21,000,000,000.

Circulating Medium.

Between 1820 and 1910, the total circulating medium of the country increased from $67,000,000 to $3,107,000,000. To-day there are individual banks, national and savings, whose resources are from one to four times as great as the total circulating medium in 1820. Six savings banks in New York City have, combined, deposits seven and a half times all the money in the country at that time.

The custom receipts in 1830 were $15,005,612, and in 1909, $300,977,438, 20 times as much.

One of the greatest advances is shown in the increase of in-

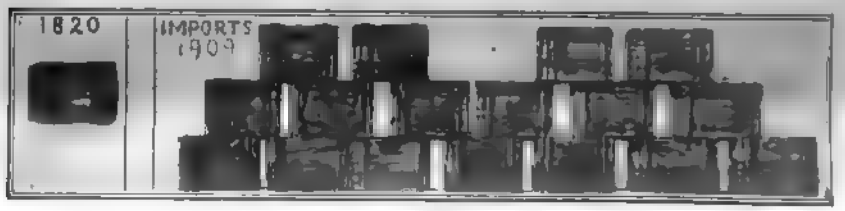
INTERNAL REVENUE INCREASED 20,000 TIMES BETWEEN 1830 AND 1910, OR AS A QUARTER PINT OF BEER TO FIVE LARGE HOGSHEADS.

ternal revenue which, in 1830, brought $12,161; to-day this revenue totals $250,000,000, 20,000 times as much as in 1830.

Uncle Sam's Cash Account. The total receipts of the government have risen from $17,840,670 in 1830, to $669,064,780, 40 fold. The ordinary expenditures of the government amounted to $15,000,000, while in 1910 they were more than $659,000,000, showing a 44-fold increase.

The war expenditures have risen from $2,630,000 to $157,000,000, 59 times the original amount.

Imports. Imports of merchandise in 1820 were valued at $74,000,000, while their value in 1910 was $1,557,819,988, 21 times as much. In other words, their original value has been added every five years.



IMPORTS INCREASED 18 TIMES BETWEEN 1820 AND 1909.

Our exports in 90 years have gone up from $69,000,000 to $1,710,000,000 in 1910, 25 times as much.

Farms. The number of farms in 1820 is not known. In 1850 there were 1,449,000, while it is estimated that there are 6,500,000 to-day.

Their value has increased from $4,000,000,000 in 1850 to $30,000,000,000, their present estimated worth. The 1910 value, therefore, is 750 per cent of the value 60 years ago.

While we produced but $73,000 worth of gold in 1820, our present production is approximately $97,000,000, 1,300 times the original amount, which has practically been added each month. We therefore produce over four times as much gold per working day as was then produced in an entire year.

Silver. The output of silver has increased from a quarter of a million dollars in 1830, to $28,010,100 in 1910, 112 times as much.

The production of coal was 3,080 tons in 1820, about 10 tons for each working day. It has grown to 371,000,000 tons, 120,000 times the original.

Petroleum. In 1859 we produced 84,000 gallons of petroleum, which has since grown to 6,976,000,000 gallons, 83,000 times as much.

The production of iron grew from a meagre 20,000 tons in 1820 to 26,000,000 tons, about 1,300 fold, while steel increased from 19,000 tons as late as 1867, to 14,000,000 tons, 738 fold.

The imports of silk have increased in value from $7,900,000 in 1830 to $110,000,000, almost 14 times.

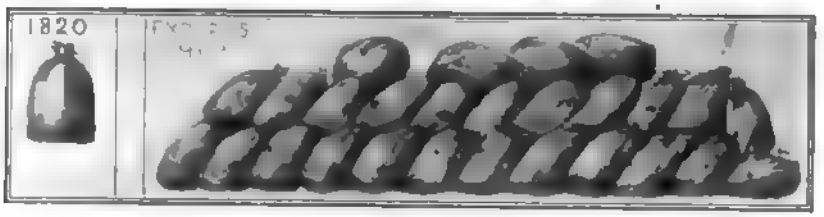
Post Office. The post office receipts in 1820 were $1,111,000, and have grown to almost $250,000,000, 225 times as much. Our receipts in a day and a half nearly equal those of the entire year then.

But the most marvelous growth in the whole range of our products and industries has been the increase in the extent of the Rail Road industry and in the service rendered by it.

Rail Road Mileage. In 1830, the dawn of practical Rail Road building in the United States, the total mileage was but 23, or less than the present street Rail Way mileage of many of our smaller cities. To-day there are 342,351 miles of Railed Ways. The original mileage has been practically duplicated every 13 working hours.

The Rail Road service of that day was infinitesimal—it did but an iota of the carrying of the nation's freight and passengers. To-day, 30,000,000,000 people and 218,000,000,000 tons of freight are carried one mile over our Rail Roads yearly.

The Modern Mercury. Marvelous as are the facts of the growth of other industries, those concerning the Steam Roads form the high lights of the whole picture. The wheels of the locomotive and the Rail Way car are the winged feet on which the nation has progressed with lightning speed to its present enviable, wonderful, unprecedented and probably unapproachable position among the nations of the earth, so that our great land carrying business seems to be the giant among industries, and the principal agent of our great and increasing progress and prosperity.



EXPORTS INCREASED 27 TIMES BETWEEN 1820 AND 1909

FIGHTING A PRAIRIE FIRE WITH A BACK FIRE.

SECTION XXXVIII.

THE MAKING OF EMPIRES IN THE UNITED STATES.

Modern Miracles in Forty-eight Fairy Tales of Fact—Proofs Positive of Progress and Prosperity.
Know Thy Country.

The New Americana—The Story of the States.

Very properly and profitably may be paraphrased the ancient Greek injunction, "Know Thyself," into "Know Thy Country." Our country is a topic upon which many of us are far from well posted.

A Romance of Reality.

We believe our readers will find few things in fiction, and few flights of fancy more alluring than the romance of reality which is developed when we delve even briefly into the story of the states making up our union. Contemplation and a full knowledge of the wonderful work of modern progress and prosperity and their mediums can but result in broadening our knowledge and making us better citizens and better Americans.

PROGRESS AND PROSPERITY AS ILLUSTRATED BY MODERN BUSINESS BUILDINGS: GROWN FROM 1 STORY TO 50; HOUSE AS MANY AS 10,000 PEOPLE, COST AS MUCH AS $23,000,000.

Uncrowned Kings. It is startling to realize that the governors of our states rule respectively over larger areas, more people and greater wealth, than the kings, princes, emperors or presidents of many of the nations of the earth.

The commonwealth of New York is popularly called the "Empire State." As a matter of fact, we have not one but two-score and eight empire states and territories, each the counterpart of some world power in one or another of the gauges of the greatness of nations, lacking only the halo of the magic words empire, kingdom, principality and republic.

The World's Wonder Work. Have you ever paused to realize that by virtue of the basis upon which cold comparisons place them, combinations of but a few of our states exceed any of what we call the "World Powers" in either population, area or wealth?

These comparisons give us a true conception and full sense of the individual and concrete greatness of our states and of our United States. So startling is the story of the place which we have assumed, that it almost challenges belief.

Strangely enough, search of the indexes of our greatest reference libraries reveals the presence of no volume, new or old, dealing with the history of all the states per se, or any comparison along the lines we follow. The articles on all the states, which follow, together with other sections of the book, taken chronologically, constitute a condensed story of the development of the United States, and the crux of its real history.

The Red Monarch. When the white man landed on the shores of America, the Indian was undisputed monarch from the Aretic Circle to the lands beneath the southern cross. The new comer immediately claimed the land in behalf of his master over the sea. In time he wrested control from the Indian, who slowly gave way before the pale face, moving ever backward toward the setting sun.

The Soil Untilled. No land ever drew its settlers from so many, so diverse, and so opposite sources. It was the Pilgrim and the Cavalier, the Huguenot and the Bourbon, the Quaker and the Jesuit, the Spaniard and the Dutchman, who settled our land.

When they came the soil was in all its untilled virginity, the country but a trackless wilderness. Forest and plain, hill and hollow, mountain and valley, knew neither the plough nor the pick, the husbandman nor the miner. Industry had not been quickened into life, and absent were the pulse and heart-beat of the modern nation.

The Beginning of Empire. At length, at the persistent call of the newcomer, the earth yielded up her riches to him. The forest gave way before the axe of the settler. The fields began to glow with golden harvests, the orchards to burgeon and bend with golden fruit, and the earth disclosed the precious hoard she had guarded so jealously and so long.

THE LAST SHOT: AN HISTORIC PICTURE OF JOHN C. FREMONT'S ENCOUNTER WITH INDIANS.

An Age of Wonders.

Westward, Ho!

It was the hardy pioneers and frontiersmen who forged ever farther west.

Before the coming of the Rail Roads, our national domain, except from the shores of the Atlantic to the forest fringe of the Appalachians, was practically uninhabited, save by the red man. Buffalo and other wild animals were abundant.

A Startling Story.

The wealth of the nation was perhaps two billion dollars, or $200 per capita, when the new day dawned with the introduction of improved land travel. To day the wealth is probably one hundred and thirty billion dollars, or upwards of $1,400 per capita.

A HISTORY OF OUR OWN TIMES.

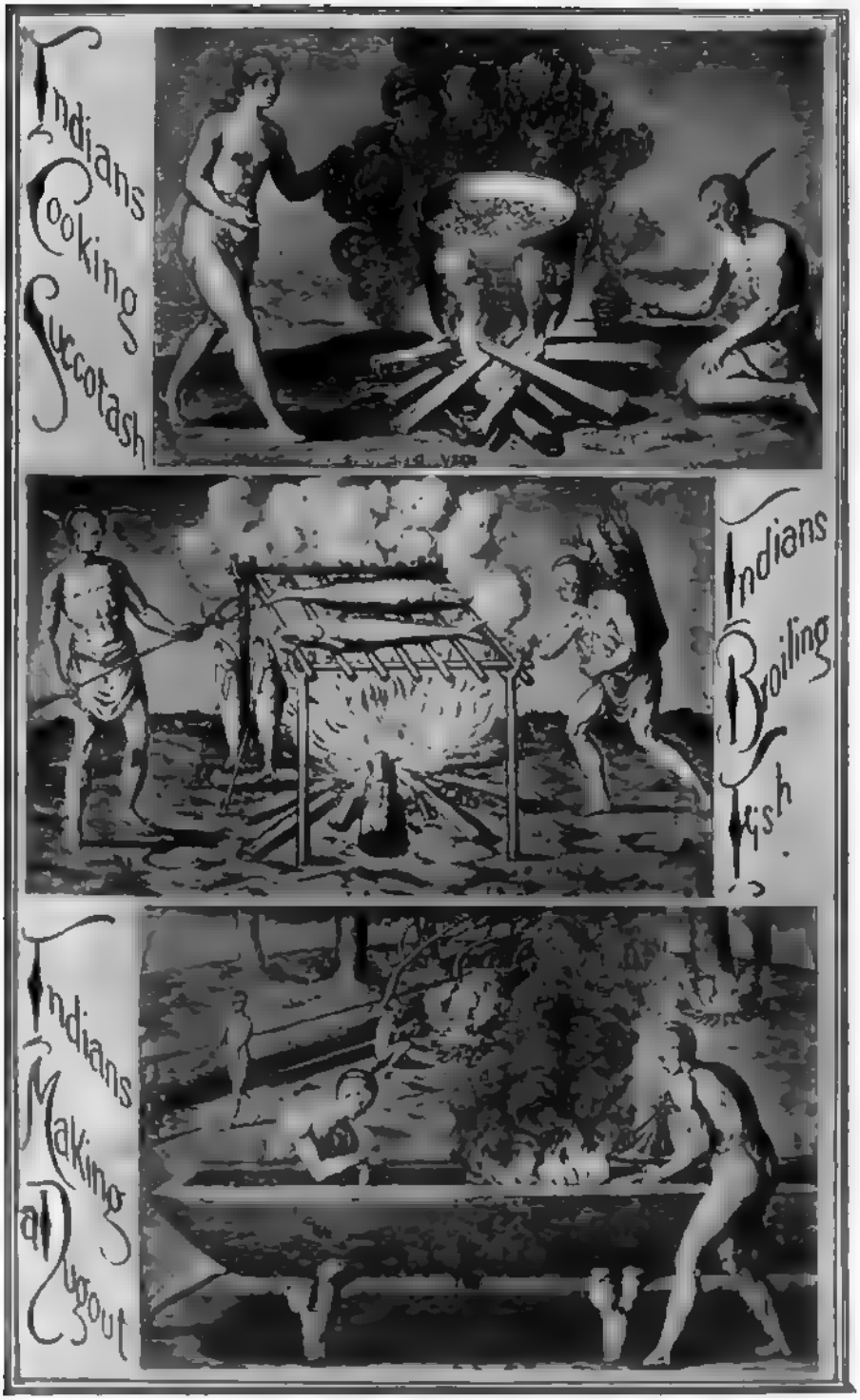
In the turmoil and tempest of modern times, we are prone to disdain to realize our past, appreciate the present, or apprehend the future.

A Life History.

Therefore, the writer believes that the reader will thank him for recalling briefly the story of the progress and prosperity of each of our states, in connection with their development through transportation. It is the "history of our own times," which many of us have failed to follow.

A Year Book of the World.

This section, with the comparisons in "The Rail Roads of the World," will give the reader the story of modern movement and many interesting facts about the nations of the earth, of how their people and goods are carried, and is to some extent an up-to-date year book of the world.



[illegible] ILLUSTRATIONS REPRODUCED FROM CAPT. JOHN SMITH'S BOOK

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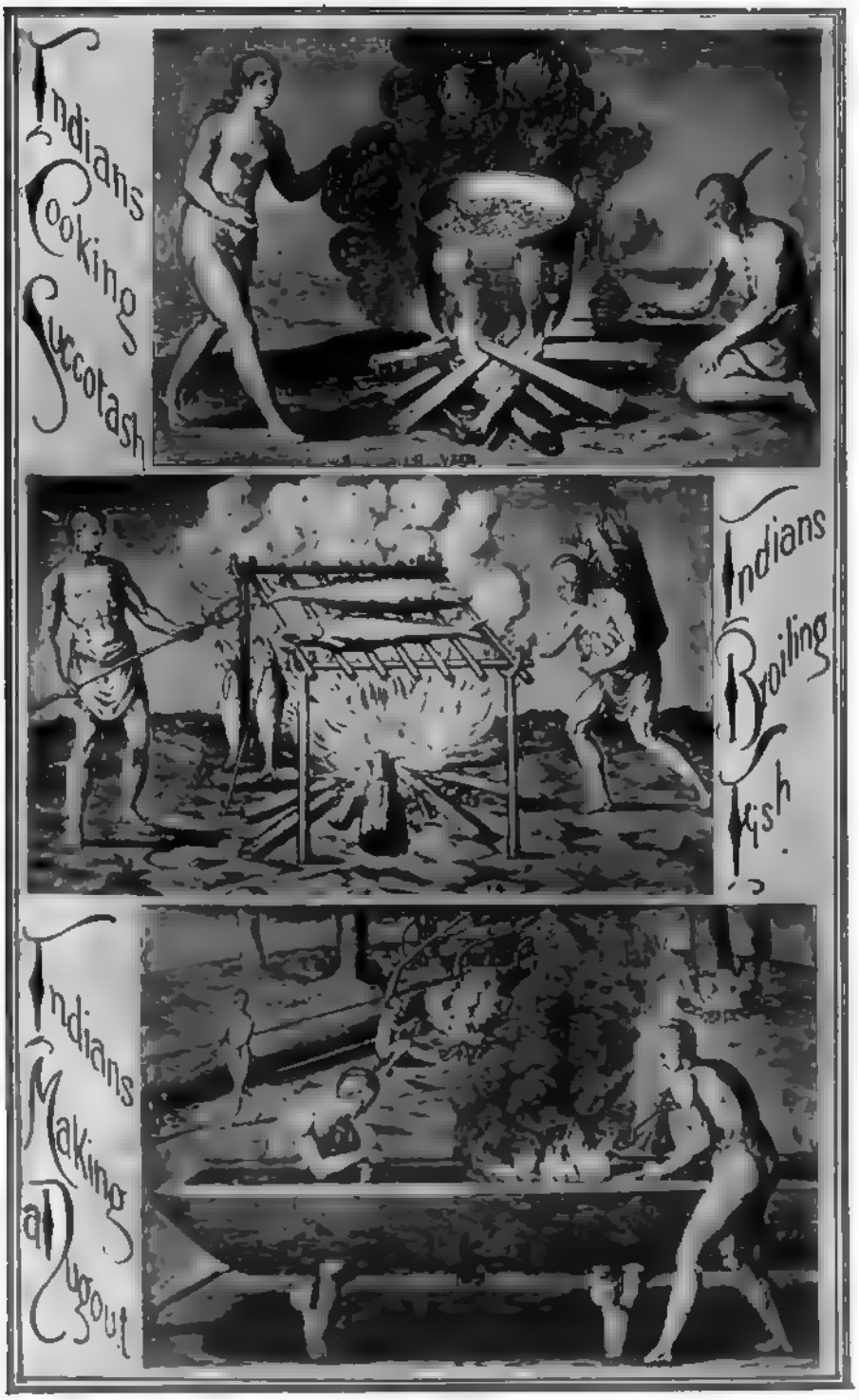


ILLUSTRATIONS REPRODUCED FROM CAPT. JOHN SMITH'S BOOK

This little résumé of each of a half-a-hundred modern miracles, by the overpowering force of its facts may awaken us to a clear appreciation that we have been favored and blessed in the United States as have been no other people on the face of the earth. Likewise, that thereby there are responsibilities owing to ourselves, to others and to posterity of which we should not be forgetful.

There is still untold and undisturbed wealth merely waiting the extension of the same developing force and facilities that have heretofore impelled us forward.

The Evolutionizer.

But, after all, in seeking the cause, do we not find ourselves against the prime force, movement, and its evolution into improved means of transportation and intercommunication?

THE FIRST UNION PACIFIC DEPOT, OMAHA

It is difficult to ignore the fact that the medium which has brought to us the leadership of nations is the cyclopean steed of steam, which has been the " open sesame " that has enabled man to force entry into the darkness of a hitherto impenetrable wilderness and bring forth its riches.

A Debt?

Of what value would be the cotton gin, were it necessary to carry cotton by wagon from the fields to its markets or ports?

Of what value to the millions clamoring for bread would be the grain and vast grain-bearing areas of our western prairies, if carriage charges were too great for them to bear?

Adding to Our Hours.

Do we properly appreciate the potent influence of improved intercommunication on our individual and national life?

Does not this common carrier, the everyday vehicle of progress and prosperity give us added time for culture, afford us opportunities for recreation and intercourse, and enable us to visit and enjoy the show-places of the earth?

A Thumb-Nail Sketch.

Let us give a thumb-nail sketch history in tabloid form of each member of the family of the states, a glimpse of the genealogy of the empires which we have builded and their status before and since the introduction of the new order of progress and prosperity.

THE MIDDLE ATLANTIC GROUP OF STATES.

Where Rail Roads Began.

We begin our story with this group, as it was the first to feel the effect of the new transportation and the impulse which it has given to progress and prosperity throughout the land.

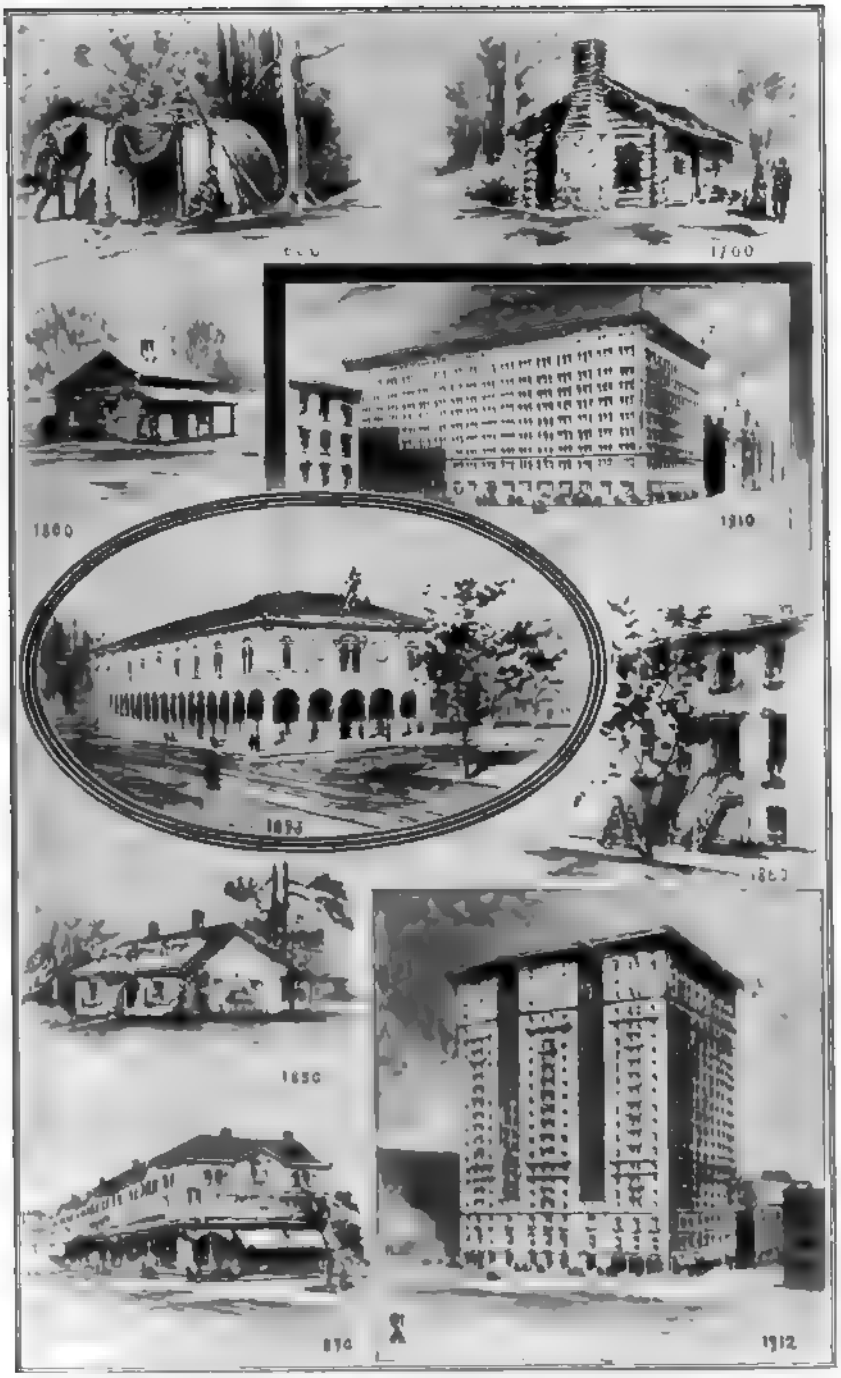
This group has the distinction of having had the first Steam Road—the Baltimore & Ohio—opened for traffic in 1830. With about 3 per cent of the nation's area, it has 21 per cent of the population and 30 per cent of the wealth.

The story of its individual units follows.

PAST AND PRESENT, BROOKLYN EAGLE N Y WORLD, SUN, AND TRIBUNE, BUILDINGS ILLUSTRATING THE PROGRESS AND PROSPERITY OF NEWSPAPERS.

New York.

When Hendrick Hudson discovered Manhattan Island in 1609 it was inhabited only by beavers, and they are said not to have thought it "worth a dam." Shortly afterwards the first settlement was made by the Dutch.



[illegible] Square, New York — From Wigwam to Skyscraper.

BUFFALO, 1860; THEN LITTLE MORE THAN A VILLAGE

When Holland Held Sway.

Peter Minuit bought all of Manhattan Island, containing 22 square miles, or approximately 15,000 acres, for the equivalent of $24. To-day it is valued for taxation at $5,000,000,000, and the entire city at $8,300,000,000. The building operations of New York City alone call for an annual expenditure of $150,000,000.

The Empire City.

New York City, when the first Rail Road was built in the state, had a population of 200,000. To-day the city has 4,766,000, and there are nearly as many people in the rest of the state, or 9,113,000 altogether. The reader may judge for himself what influence transportation had upon this development.

Strange to say, New York state's first Rail Road was not built even near New York City, but at the head of navigation, 150 miles away. It was the Mohawk & Schenectady, which was completed in 1831. The Saratoga & Schenectady, an extension from Saratoga to Schenectady, followed.

The reader has only to think of the tide of commerce that, from points 1,000 and more miles distant, has been turned and hauled across prairies and the eastern mountains, instead of following a natural water outlet, down the Mississippi and its tributaries, or through the St. Lawrence to realize what New York's position would be were there no Steam Roads.

The Transforming Force.

Many great ports of Europe are at the mouths of important rivers, navigable for hundreds of miles. New York is on the Hudson, navigable only for 150 miles, the shores of which are largely moun-

THE FIRST AND SECOND CAPITOLS OF NEW YORK. THE FIRST COST PROBABLY $2,700, THE PRESENT $27,000,000

tainous, the traffic and products originati in this territory being only enough to make or maintain a fourt s city.

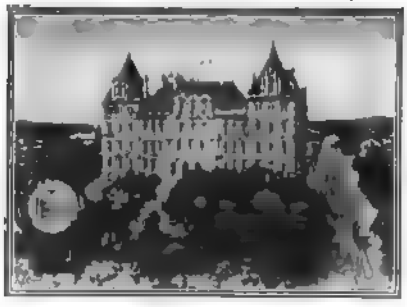
The reader may draw his own inferences whence could come the great artificial trade and wealth of the teeming millions of this, the second largest city in the world, had not the Railed Roads brought the products of the state and nation to the metropolis. There is invested in manufacturing in the state to-day over $2,050,000,000, and the annual output of the 40,000 industrial plants has a valuation of almost $3,000,000,000, nearly as much as all the actual money in circulation in the United States.

Rank Among the Nations.

New York state has about 8,600 miles of Rail Ways now to serve her 9,000,000 people, or enough to build a Pan-American Rail Road from New York City to Valparaiso, Chile. The state's population is equal to the combined enumeration of the kingdoms of Bavaria and Wurtemberg.

If the king of Italy, the king of Wurtemberg or the king of Bavaria were to come over to the United States, the whole country would be in a turmoil to do him honor. Yet the uncrowned governor of New York rules as populous a nation as the latter two monarchs combined, and as much wealth as the first-named monarch.

Its area of 50,000 square miles is equal to the aggregate area of Scotland and the kingdoms of Belgium and Denmark.



N Y State Capitol, and great seal of the State

New Jersey's State Capitol.

New Jersey.

The Dutch planted at Bergen probably the first settlement in New Jersey. This was between 1617 and 1620. The region occupied somewhat the position of a shuttlecock. In 1634 it was named New Albion by Sir Edmund Ployden, who obtained it as a grant from England.

Heterogeneous Ancestry.

Later Swedes and Finns purchased a section of the territory; then the Swedes and Dutch together drove out the English. When the section from the Delaware to Connecticut was granted to the Duke of York by his brother, Charles II. of England, York proceeded to drive out the Dutch. Quarrels over the ownership of New Jersey

continued until 1702, when it was surrendered to England and became a royal province.

A Beehive of Industry.

New Jersey, which has more steam Rail Road mileage to the square mile of territory than any state in the Union, also ranks first in the manufacture of silk and silk goods, the annual output being valued at $50,000,000, 40 per cent of the output of the entire United States. Its density of population is 332 persons to the square mile.

New Life.

New Jersey shared in the Rail Way boom of the 30's, her first Rail Road being the Camden & Amboy. An interesting feature of early Rail Road operation in New Jersey was that the state levied a tax of fifty cents on every one crossing Jersey on a Rail Road. We can imagine how the cost of travel would be increased if such a charge were levied by every state to-day. By 1860 there were 560 miles in the state, and the population had increased from 320,000 to 675,000, the three-decade growth being four times as great as that from 1800 to 1830, and as much in 30 years as in the two centuries previous.

By 1880 the mileage had increased to 1,684, and the population, keeping pace, was 1,131,000. The manufacturing output in that year was valued at $254,000,000. In 1900 the state was criss-crossed by 2,250 miles of steel network and the population numbered 1,900,000. Manufacturing had increased so that the output was valued in that year at $611,800,000, an increase of 150 per cent in 20 years.

The March of Progress.

To-day the Rail Road mileage, 2,500, means 31 miles to every 100 square miles—the largest in the United States. The population has increased to 2,537,000, and the value of the output of the 7,500 manufacturing plants in the state is placed at $850,000,000.

New Jersey, in geographical limits, is one of the baby states, Delaware, Connecticut and Rhode Island being the only ones with less area. But the Iron Roads have brought and encouraged business and made it one of the greatest of the many empires which constitute the Union.

Greater Than Venezuela.

New Jersey's area of 8,000 square miles is less than one-half that of Switzerland and its population three-fourths as great, but its wealth of $4,500,000,000 would pay the debt of the United Kingdom of Great Britain and its colonies. The population equals that of the United States of Venezuela, which is more than 40 times as large.

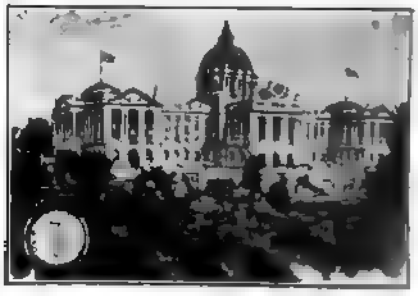
Pennsylvania.

Pennsylvania is the home of and has given its name to one of the greatest of modern Rail Roads.

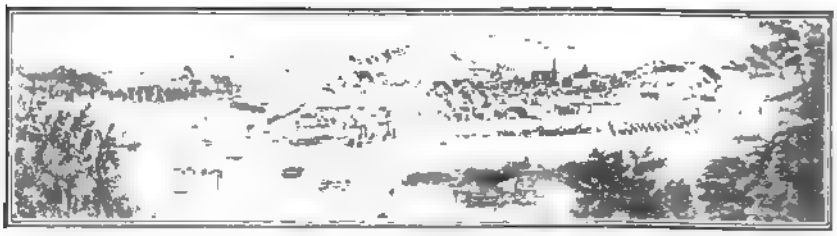
The early history of the state, after its settlement by William Penn, is so familiar that recapitulation is unnecessary. "Valley Forge," "Independence Hall," and the first federal capital, suggest the part it took in the struggle for American independence.

OLD STATE HOUSE, PHILA., ERECTED 1735

THE NEW PENNSYLVANIA STATE CAPITOL



Quickening. In 1842, when the Philadelphia & Reading Rail Road was opened, Reading had 8,000 inhabitants. In eight years the number was doubled, and there are 96,000 persons in Reading to-day. The opening was celebrated by an immense procession of passenger cars, containing 2,150 persons and three bands of music, drawn by a single engine. In the rear was a train of 52 burden cars, loaded with 180 tons of coal. It is interesting to note that a freight car of those days could carry only about three and a half tons, and that the entire burden of these 52 cars could be transported in four "battleship" coal cars to-day.



PHILADELPHIA IN 1854

"Brotherly Love." In 1830 Philadelphia had no Rail Roads and a population of 160,000, while in 1910 the principal line of the country served her and the population under the impetus of the iron horse, had leaped to 1,549,000, a 1,000 per cent increase.

In 1840 the Great Western Iron Works in Pennsylvania started to make iron rails. These mills, in 1857, made the first T-rails. The first Bessemer steel rails were manufactured at the same place.

Circling the Globe. To-day Pennsylvania has within her borders 12,000 miles of Rail Road, enough to reach two thirds of the distance around the earth in the latitude of Philadelphia. The state has a population of 7,665,000 people, against 1,250,000 around 1830.

Pennsylvania annually mines 150,000,000 tons of coal, as compared with but 41,000,000 as late as 1880. The state produces 12,000,000 tons of pig iron, as against 4,000,000 10 years ago. Besides this, $40,000,000 in lumber is marketed yearly.

Her factories turn out annually $2,000,000,000 in products, as compared with $1,500,000,000 10 years ago, and $700,000,000 in 1880.

The City of Pittsburgh.

Pittsburgh is estimated to be the first city in America in freight tonnage, and first in banking capital outside of New York. Its manufacturing output is 20 per cent of the total tonnage credited to the entire state. This is remarkable when it is considered that not until 1840 did the sound of the steam steed resound through the Western Pennsylvania hills. The city then had a population of 20,000, as compared with 533,000 to-day. Such has been the evolution from the wilderness of the frontier Fort Duquesne in the days of Braddock and the beginning of the military career of our first president, in the French and Indian war.

BETHLEHEM STEEL CO., 1910.

Iron and Steel.

The city's great tonnage largely is accounted for by the fact that Pittsburgh produces no less than $100,000,000 in iron and steel and $250,000,000 in other products annually. In 1880 the aggregate was but $75,000,000, showing a 400 per cent increase in little more than a quarter of a century.

An authority has estimated the available coal supply of the Pittsburgh region at 30,000,000,000 tons, 25 per cent of the state's total, and a quantity sufficient to fill 30 trains of cars, each train as long as from the earth to the moon.

Identical Stories.

The history of Pittsburgh from a Rail Road standpoint is also the story of its rolling mills. The rails produced in a year by them would be sufficient for 10,000 miles of single track, enough to build a double track from New York to New Orleans, with a single track extension through Texas, Mexico, Central and South America

to Buenos Aires, with almost enough left to run [illegible] ce to Valparaiso, Chile. The axles would equip over 100,000 [illegible] sufficient to constitute a solid train 700 miles long.

The Why and Wherefore.

The student need not seek further than modern transportation for the cause of the rise and development of this empire with a population greater than Turkey in Europe. The wealth of the state about equals half that of Italy, or all that of Spain and Portugal combined.

Delaware.

This state is said to have had the second tramway in the United States, from the quarries of Lapidea Manor to the Delaware river, some five or six miles.

In 1609 Hendrick Hudson discovered Delaware Bay, and in 1611 Thomas West, Lord Delaware, explored it.

The Dutch Foundation.

The first settlement was made by Dutch from New Netherland, who, in 1631, formed a colony at Lewes Creek. These colonists were massacred by the Indians in 1632.

In 1638 Wilmington was settled by the Swedes. In 1674 British possession became absolute, the territory having been included in Sir Walter Raleigh's patent from Queen Elizabeth.

Varied Owners.

William Penn obtained possession of Delaware, and for about 20 years it was a part of Pennsylvania. Then it formally withdrew from Pennsylvania and became nominally a separate colony, although retaining the same governor.

Delaware was the first state to ratify the Constitution, in 1787, and it had framed its own state constitution even earlier.

Growth of Great Roads.

The first Rail Road in Delaware was built in 1831, from New Castle to Frenchtown, 17 miles. At first the cars were drawn by horses, but in 1832 a steam locomotive was imported. By 1860 the mileage of the state had increased to 127, and in 1907 it was 362, or a mile of Rail Road to every six square miles of territory.

The population of Delaware in 1790 was 60,000. In 1830 it was 76,000, an increase of but 400 a year. Since the advent of modern carriage the population has increased to 202,000, or about five times as rapidly as before the iron steed began his journeyings.

The State's Businesses.

The principal manufacturing industries are iron and steel. The fruit canning and preserving industries advanced 112 per cent in the 20 years from 1880 to 1900. The total value of Delaware's agricultural crops amounts to fully $10,000,000, while the manufactures are no less than $41,000,000. The wealth of the state is a quarter of a billion dollars.

DELAWARE STATE CAPITOL.

MARYLAND STATE CAPITOL.

Maryland.

Lord Baltimore. Maryland was settled in 1634 by a party of Englishmen under Lord Baltimore. The proprietor, Cecil Calvert, received the whole territory from Charles I. In 1652 the Duke of York, afterwards James II., through ignorance of the country, deeded to William Penn some of the land previously granted to Lord Baltimore.

This led to a lengthy dispute, which ended only with the location of the Mason and Dixon line, famous as the dividing line between the North and the South.

Our National Anthem. It was during the defense of Baltimore, in the war of 1812, that Francis Scott Key wrote our national anthem, "The Star Spangled Banner." It seems but fitting that the first Railed Road in the United States should have been born near the same spot where that stirring anthem was inspired.

Maryland had the first steam Rail Road in the United States, the Baltimore & Ohio, finished in 1830.

It was from Baltimore, in May, 1838, that the first regular steam packet sailed from the United States for the other side of the Atlantic. From Baltimore, too, and along the line of the first Rail Road, Morse transmitted the first telegram; its historic words were: "What hath God wrought!"

A Queen of Cities. Baltimore is now the largest city in the South and the seventh in the Union. It was the first in America to have a water company (1792), gas lights; and an electric street Rail Road (1881).

Notwithstanding the disastrous fire of a few years ago, Baltimore to-day has a population of 560,000, against 60,000 in 1820, and is again growing rapidly.

Billion Every Four Years. The value of Maryland's manufactures is a quarter of a billion per annum, which is an amount almost five times the total value of the trade of the United States with the rest of the world in 1830. Maryland has 46,000 farms, the products of which approximate $50,000,-

000 in value yearly. The value of all farm property exceeds $200,000,000, and the whole state has a value of $1,750,000,000.

Maryland has the unique distinction of having the most important under-water farms in the United States. It is estimated that her oyster beds in the last 50 years have yielded crops which sold for a quarter of a billion dollars.

Population. In 1634 Maryland had a population of 200. Despite the fact that it is cut by waterways, it took 200 years, to 1830, for this population to grow to 447,000. In 1910, after 80 years of modern land traffic, it had grown to 1,295,000.

THE FOUNDERS OF THE B. & O.

Such, then, has been the history of this commonwealth before and since the introduction of steam transportation. In proportion to its area, the 1,400 miles of Rail Road equal the 9,000 miles of Michigan, and are twice the average for the country. They would make a Rail Road from Boston to New Orleans, passing through New York, Philadelphia, Baltimore, Washington, Atlanta and Montgomery.

Japan's Food Productivity. It is rather startling to realize that Maryland, which we regard as one of our smaller states, has an area as great as the arable ground of the empire of Japan, which supports a population of 49,000,000. When you think of Maryland again, and couple this thought with it, you will have a higher conception of it as one of the units of our country.

THE SOUTH ATLANTIC GROUP.

We follow with the South Atlantic group, as it was in this section that the second important effort at steam land carriage was made in the United States.

The Steam Road mileage of the South Atlantic group of states, 27,000, equals the facilities of India, with its 300,000,000 people. In the 75 years following the introduction of better carriage, this group increased 650 per cent in wealth

Virginia.

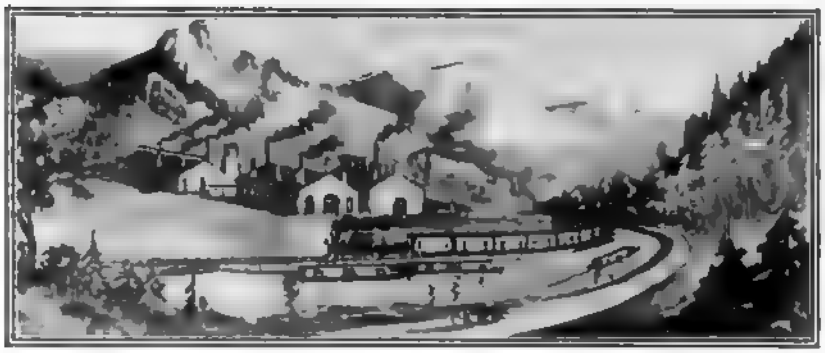
"Mother of Presidents."

Virginia, "Mother of Presidents," was the first of the American colonies to be settled. More of human interest attaches to the early history of this state than to that of any other. Settled in 1607, at Jamestown, its early struggles and its growth are familiar.

During the quarter century following 1861, Rail Road construction lagged, and the state, left bruised, crushed and bleeding by the civil war, reacted slowly.

Recovery After the War.

In 1870 the population was less than in 1860 by almost 300,000; in 1880 it was still somewhat below 1860, and not until the Rail Road began to show a growth commensurate with that in other states was the real progress of the Old Dominion resumed and prosperity regained.



EARLY VIRGINIA IRON WORKS, CANAL, AND RAILROAD

By 1900 the Rail Road mileage, which had been 1,379 in 1860, and had increased only 500 miles in 20 years, had increased to 3,160, 60 per cent of this 40-year growth having been made in the last 15 years of the period, or a rate of growth three-and-a-third times the annual rate during the first 25 years of the 40. The population showed the effect, increasing from 1,500,000 in 1880 to 1,854,184 in 1900. To-day the state has 2,061,000 persons within her borders, equal to the number of inhabitants in the kingdom of Norway, and has 4,344 miles of Rail Roads. The Rail Road mileage is nearly four times that of Norway.

The area of the state—40,125 square miles—is equal to the combined areas of the kingdoms of Greece and Denmark.

Piling Up Prosperity.

The wealth of the state, $1,500,000,000, shows a growth over 1900 of more than 25 per cent.

Manufactures also have reflected the revival of transportation facilities. In 1880, just before the revival set in, and when the state was served by only 1,900

miles of road, the value of the annual output of the factories of the state was $27,000,000.

By 1900 the value of the output had increased to $108,000,000, an increase of 300 per cent in 20 years; by 1908 the value had risen to $175,000,000, a 550 per cent increase in 28 years.

The Race Eternal.

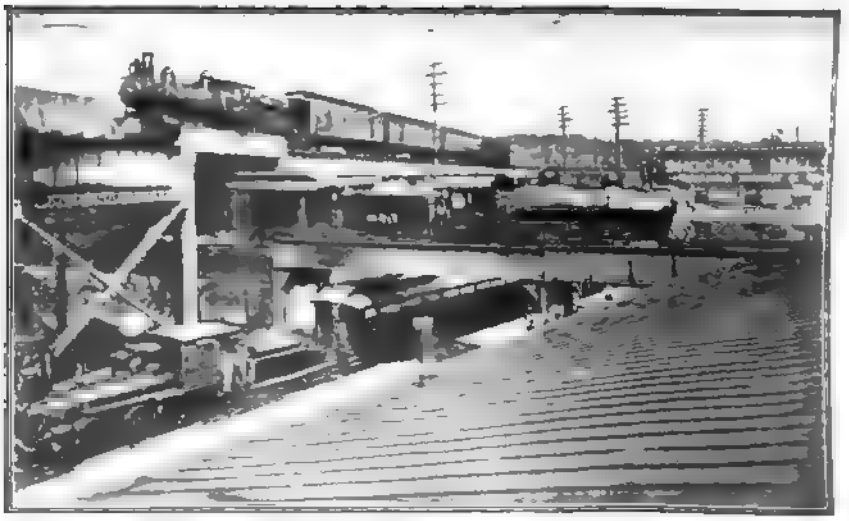
Rhode Island is frequently pointed to as a great manufacturing state—as it is. In 1880 its manufactured output was 300 per cent greater than that of Virginia; in 1890 Rhode Island only exceeded Virginia's output by 70 per cent; in 1908 Rhode Island found it difficult to maintain its lead, Virginia running only 20 per cent behind its New England competitor.

Virginia is an agricultural state in the lowlands and lesser highlands; its coal output is 4,500,000 tons; it is an iron producer of large proportions, and has many other mineral resources.

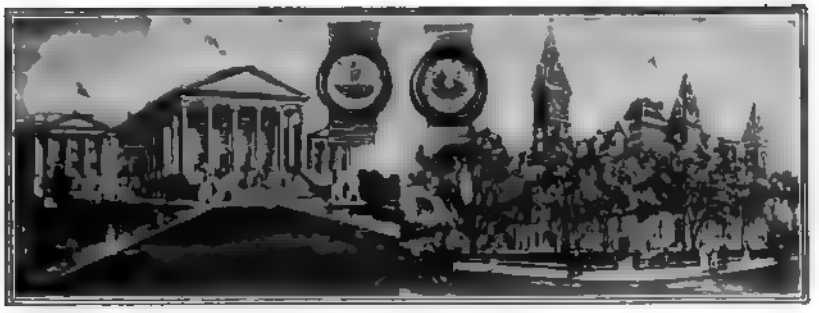
Substantial Prosperity.

Half a million tons of pig iron were produced in 1909, and the tobacco crop was 125,000,000 pounds, enough to supply every adult male in the United States with six pounds of Virginia tobacco a year.

This is but a glance at Virginia, giving just enough of a peep to enable one to conjecture as to the future greatness of the state—and to indorse the belief of every one of her sons that the Old Dominion will again come fully into her own.



[illegible] RICHMOND, VA



CAPITOL AND SEAL, VIRGINIA. CAPITOL AND SEAL, WEST VIRGINIA.

West Virginia.

"Reasons of State."

As a political and military measure, West Virginia was separated from the Old Dominion during the civil war, in 1863.

She has 10,000,000 acres of coal land, but it was not until '64 that the first mine was opened. West Virginia had her first taste of improved transportation in the old National Turnpike, running from Virginia to Ohio.

Opportunity Seized.

To-day there are five Rail Roads across the state, and the total mileage is 3,500. Up to a short time ago, there was no Rail Road running north and south across the state, and to reach the state capital many of West Virginia's senators and representatives had to go around three sides of a square in order to get to it.

The state ranks third in the production of coal and coke, the former having increased from an annual output of 1,500,000 tons in 1880 to 52,000,000 tons. She produces now every twenty days as much as she formerly produced in 365. The value of the oil and petroleum shipped from the state is in excess of $8,000,000 a year.

Said Mark Twain:

Speaking of the appearance of the West Virginia coke and gas region at night, the late Mark Twain said: "It looks like Hell with the lid off."

The first Rail Road in West Virginia was built about 1850. The population at that time was approximately a quarter of a million; to-day it is nearly five-fold as much—1,221,000.

This population is equal to that of Hesse—the greatest of all the German principalities, and the state's area is equal to that of Greece.

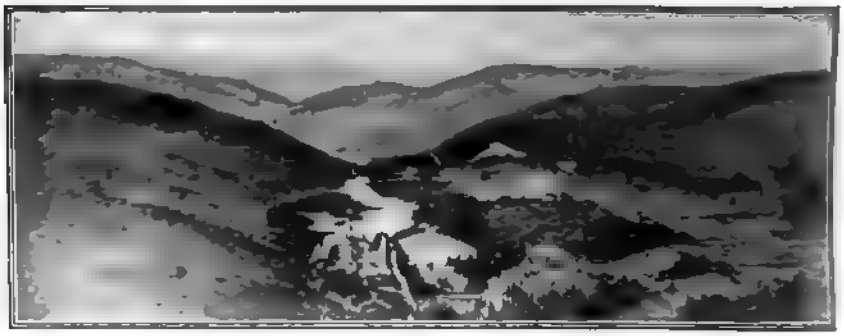
North Carolina.

In the past 55 years the value of the output of the Old North state's factories increased 1,600 per cent. In the same period the Railed Road mileage increased 850 per cent.

Raleigh's Expeditions. Sir Walter Raleigh, in 1585, and again in 1586, unsuccessfully attempted to colonize this region. In 1653 emigrants from Virginia settled along the shores of Albemarle Sound. North Carolina was one of the original 13 states.

Independence. On April 12, 1776, the North Carolina Provincial Congress instructed its delegates to the Continental Congress to vote for a Declaration of Independence; this was the first official utterance by any colony in favor of autonomy and independence. It was preceded by the famous Mecklenburg Declaration of Independence early in 1775.

Advent of Steam Roads. The Raleigh & Gaston Rail Road was chartered in 1833. The substantial development of the Rail Road did not commence until after 1850—from which period North Carolina likewise dates her real growth.



A RAILWAY CLIMBING THE MOUNTAINS TO ASHEVILLE. VISIBLE AT 21 POINTS.

On May 20, 1861, following the call of President Lincoln for troops to invade the South, the state followed her sister state and seceded from the Union, these two leading the way for the others.

"For Bravery in Action." With a voting population of only 115,000 in 1860, the state sent 10,000 more than that number, 125,000 troops, into the service of the Confederacy, besides 3,000 to the Union army. North Carolina's losses were about 40,000 men, the largest proportion of any Southern state.

Her Crops. In 1908 the principal crops were corn, cotton, tobacco and wheat, worth with the smaller crops approximately $100,000,000. In 1880, when the Rail Road mileage was 1,400, as compared with 5,200 miles to-day, these several crops were valued at only from a half to a seventh as much, the then total being equaled by the 1908 corn crop, and exceeded by the cotton crop.

Croesus Outdone.

The value of the manufactured products in 1850, practically the real beginning of the Rail Road era, was $9,000,000. A half century later, in 1900, it was $94,000,000, nearly 1,050 per cent of the former figure. In 1905, it was $142,500,000, and had, therefore, increased 1,483 per cent on the 1850 ouput.

In 1850 the value of timber products was $1,000,000; in 1880, $3,200,000. By 1900 a sixteen-fold increase over 1850 was shown. In 1908 the output of timber and products was $35,000,000.

Practically every known mineral and every geological formation are found in North Carolina. The principal mineral products are stone, clay and mica; about $100,000 in gold is mined each year.

The Power of the Rail.

The Rail Ways in the state are valued at $85,380,803, and would stretch from Raleigh, its capital, to Valparaiso, Chile. The total wealth of the state is about $1,000,000,000, or greater than the nation's debt.

In size, North Carolina is half as large as the entire kingdom of Italy. The population equals that of the kingdom of Norway.

North Carolina is no laggard, and there is no suggestion of the Tar Heel in its story.

NORTH CAROLINA CAPITOL. SOUTH CAROLINA CAPITOL.

South Carolina.

Settlement.

South Carolina, one of the 13 colonies, was the second state to have a Rail Road. An attempt to settle this territory was made by the French Huguenots in 1552. This is said to have been the first settlement upon the Atlantic coast of the United States, and it was named Carolina in honor of their king, Charles IX. of France.

Proprietary.

Following its settlement in 1670, it was claimed by the English by right of the discovery of North America by John Cabot in 1497.

Charles II. of England granted it to eight English noblemen, as lords proprietors, the grant covering about one-third of what is now the United States. This proprietary government, however, was overthrown by the people in 1719.

Early Exports. In 1748, 600,000 deer skins, valued at $180,000, were shipped from Charleston. Later this port became famous for its exports of rice and indigo, and in 1775 the export value of these commodities alone was about 1,000,000 pounds sterling, a third of the entire estimated trade of the colonies in 1768. In those days, as to-day, South Carolina rice was the finest in the world and commanded a high price.

The serious expression, in 1773, of Josiah Quincy, writing about Charleston, S. C., might to-day be regarded as a choice bit of humor, as we compare it with conditions in the greater cities of the United States. He said:

Early Splendors. "In grandeur, splendor of buildings, equipages, commerce and number of shipping, it far surpasses anything I ever expected to see in America."

During the revolution, 137 engagements with the British took place in South Carolina, in 103 of which the Carolinians fought the foe unaided.

SOUTH CAROLINA COTTON VIEW, MILL SCHOOL AND MILL DWELLINGS.

Wide-Awake Carolina. It would seem but fitting, judging from such a progressive history, that South Carolina should have been the first state in the South, and the second state in the country to have a Rail Road. It seems amusing that the longest line in the world in 1832 was the Charleston & Columbia, 133 miles in toto.

Growing. South Carolina, at that time, had a population of 581,185, in 1910, the population was placed at 1,515,000. The wealth of the state was $585,000,000 in 1904. The area of the state, 31,000 square miles, is equal to that of Bulgaria or the kingdom of Bavaria.

In the use of water power and transmitting electric power, South Carolina is first. In the cotton manufacturing industry, the state ranks second. South Carolina leads in the United States, east of the Rockies, in the production of gold.

The Growth of Wealth.

The Rail Road mileage in 1850 was 289; to-day it is 3,300 miles. The increase was 1,032 per cent.

In 1850 the cotton crop was 300,901 bales; in 1909 it was 1,290,375 bales. In manufacturing $125,000,000 is invested, and the value of the manufactured products in a recent year exceeded $85,000,000.

THREE TYPES OF THE NEW SOUTH, ATLANTA, GA.

Georgia.

A Margravate.

Although the last of the 13 colonies to be settled, Georgia was traversed by Fernando de Soto as early as 1540, 67 years before the settlement of Jamestown.

Several other explorers touched the region in the early days. In 1717 it was granted to Sir Robert Mountgomery as a margravate, but not until 1733 was a permanent settlement made, when Oglethorpe founded his famous colony as a refuge for debtors.

He planned to establish it as a silk-producing section, but not until recently has that industry been revived in a manner and on a scale which promise any permanence.

Making Markets.

As late as 1884 the marble quarries of the state brought in no returns whatever; to-day, with the assistance of improved means of transportation—there being 7,000 miles of Rail Road, against but 600 miles in 1850—the marble and granite industries are of such importance that many streets in St. Louis, 600 miles distant, are paved with granite blocks from Granite mountain, near Atlanta. Public buildings almost all over the nation are built of her marble.

The Man With the Pick.

Coal and iron, manganese and roofing slate are mined, and the gold deposits, which were important before the California discoveries, are still worked. Diamonds, amethysts, moonstones, rubies and sapphires are also found in small quantities.

Cotton.

The state is a tremendous producer of cotton, the crop for 1908 having been 2,100,000 bales, valued at $101,867,948. The value of the textile industry has risen astoundingly of late. In 1890 it was but $12,000,000; ten years later, it had reached $20,000,000, and in 1908 was $50,000,000.

The Earth's Bounty.

Georgia's famous watermelon output requires more than 10,000 Rail Road cars to transport it. The 1908 crop of peaches reached 6,000 carloads, and it is estimated there are close on to 20,000,000 peach trees in bearing in the state. A solid train 125 miles long would be required to haul her crop of peaches and watermelons.

In 1907, 853,697,000 feet of lumber were cut by the 1,254 establishments engaged in that industry, with a capital of $11,800,000.

Tar, Pitch and Turpentine.

The state stood first in 1900 in the manufacture and export of turpentine and rosin, the output being 14,600,000 gallons of spirits of turpentine, and 1,500,000 barrels of turpentine, rosin and pitch. In manufacture of all kinds, $165,000,000 is invested, and the annual output is valued at $200,000,000. In 1880, when the Steam Road mileage was but 2,459, as compared with 7,000 miles to-day, the manufacturing output was but $35,000,000.

The wealth of the state is approximately $1,500,000,000, equal to the total yearly revenue of the Russian empire. And the governor of the "Cracker State" rules over the destiny of more people than does his majesty, the king of Denmark.

Florida.

A Search Not Totally Failing.

Florida was discovered on Easter Day, 1513, by Ponce de Leon, a Spaniard, who was searching for the famed fountain of youth. Early attempts by Spaniards to settle were not successful.

CAPITOL, GEORGIA. CAPITOL, FLORIDA.

In 1564 the French Huguenots attempted a settlement. In 1565 the Spaniards settled in St. Augustine, being the first permanent settlement in North America. In 1763 Florida was ceded to England in return for Cuba. In 1789 it was re-ceded to Spain, and the inhabitants, or almost all of them, promptly moved into the United States. In 1819 the United States secured the Peninsula, which was made a territory in 1822, and in 1845 was admitted as a state.

Beginning to Grow.

In 1850, twenty years after the introduction of Iron Roads in other states, it had 21 miles of such road and a population of 87,000. In spite of its favorable peninsular position, the lack of this improvement seemed to make itself felt in keeping down the population. After the introduction of modern transportation to an appreciable extent, Florida moved ahead very rapidly. By 1860 there was a population of 140,000 and 400 miles of Rail Road. To-day, with its 4,000 miles of Steam Road, Florida has a population of 752,000. Florida is building a "web-foot" Rail Road across the Keys at present, to reach Key West, only 90 miles from Cuba.

Modern hotels, St. Augustine. Reclaimed farms, Everglades.

In the last quarter century the value of manufactured products has increased from $5,000,000 annually to $50,000,000. In the same period the Rail Road mileage increased 8,000 per cent, having been 500 in 1880, and the lumber output increased from $2,000,000 to $4,500,000.

Fruit and Vegetables.

A million dollars' worth of oranges, a half million in other fruits, and as much in sugar and molasses, a million dollars' worth of sweet potatoes, and two million dollars' worth of other vegetables is Florida's annual contribution to relieve the hunger of the people of other states. Twenty-five years ago these crops were so small and insignificant that only a nominal record of them was made.

A Kingdom.

The state to-day has a population as great as that of the Grand Duchy of Mecklenburg, while in size, it is twice as large as the kingdom of Bavaria.

THE NEW ENGLAND GROUP.

The New England group completes the Atlantic states, which made up our 13 colonies and which were the first to develop.

New England is not an important section agriculturally, its lands in great part are comparatively poor and unproductive. But when the increasing population and the stationary or decreasing productivity of the farm began to be felt, the region met the contingency by transferring its energies to manufacturing, producing today almost 20 per cent of the annual output of the factories of the nation; thus New England's manufactured products almost equal the value of the nation's annual crops of corn and wheat.

OLD WORCESTER RAILWAY DEPOT.

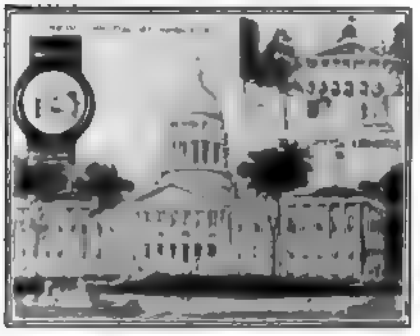
Massachusetts.

From Far and Near. The early history of Massachusetts, originally known as Massachusetts Bay, and at one time a part of Virginia, later part of New York, is the early history of the country to such an extent that it is a familiar story to all. It is sufficient to recall that in 1620 the first settlement was made by the Pilgrim Fathers, that the people had many wars with the Indians; that there were also many internal dissensions; that it was the scene of the curtain-raiser to the Revolution, the Boston Tea Party, and also of its first battle, that of Lexington.

Great Riches. The state to-day is immensely rich. The value of manufactured products approximated a billion and an eighth in 1905; seven times the total exports and imports of the United States in 1800. Her industry of booting and shoeing the nation alone brings in $125,000,000 yearly.

The population has increased from 610,000 in 1820 to 990,000 in 1850, and to 3,366,000 in 1910, while the Rail Roads, of which there were none in 1820 and only 1,000 miles in 1850, to-day amount to 2,500 miles, almost long enough to connect Boston with Liverpool.

A World Power. What a world power Massachusetts would be if she were in Europe may perhaps best be realized when it is known that the state has grown so as to have as large a population as the republic of Switzerland, one of the most closely populated nations on the face of the earth, and that the wealth of the state, $5,500,000,000, is perhaps greater than that of the world power, the Netherlands. Its area of 8,266 square miles is about double that of the kingdom of Saxony.



OLD AND NEW CAPITOL, MAINE.

MASSACHUSETTS CAPITOL.

Maine.

Exploration. Verrazano, an Italian explorer in the employ of Spain, sailed along the coast of Maine in 1524. The first settlement of what is now the state of Maine was made in 1604 at St. Croix Island by de Monts, a Frenchman, but the settlement was abandoned the following year An English colony settled in 1607 at the mouth of the Kennebec but the colonists, on account of the death of their leader, returned to England in 1608.

In 1652 the colony of Massachusetts Bay assumed control of the territory, and Maine remained a part of Massachusetts until 1820, when it became a state.

An Early Start. The first Railed Way, the Bangor, Oldtown & Milford Rail Road, was chartered in 1832. The development of the state since then has been intimately connected with the growth of its Iron Roads. How rapid has been the spread of the tentacles is indicated by the increase of their mileage from 200 in 1850 to 2,200 at the present time, a growth of 2,000 per cent. In the same period the population has increased from 583,000 in 1850 to 742,000 in 1910.

How She Grows. The industrial progress of the state has been rapid in recent years. The 14 leading industries of the state include, among others, lumber and timber products, cotton goods, woolen goods, boots and shoes, canning and preserving, fish, printing and publishing, ship building, and leather, marble and stone work. Fourteen industries in 1905 controlled 82 per cent of the manufacturing capital of the state, gave employment to 79 per cent of the wage earners and represented 78 per cent of the state's industrial product of $150,000,000.

Viewed With Eyes of Logic. The area of the state, 33,050 square miles, equals that of Portugal. To-day Maine is 800 times a millionaire. The population of the state is greater than that of the republics of Panama and Nicaragua. When the representatives of this state meet in legislative convention it is, therefore, probably as important an event as the coming together of the congresses of our sister republics.

CAPITOL, NEW HAMPSHIRE.

New Hampshire.

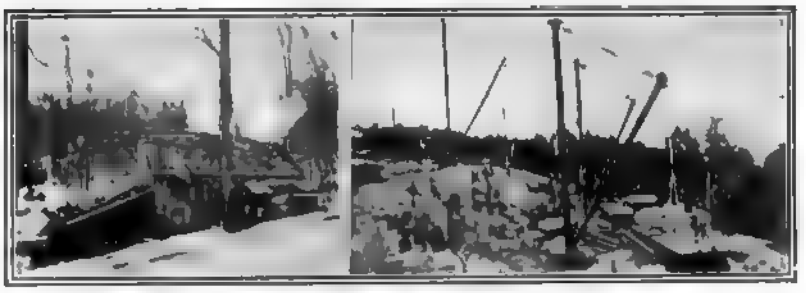
History. The first settlement in what is now New Hampshire was made by David Thompson in 1622. This was the first state to adopt a constitution, and in 1775 it had already declared for independence. Twice it had been annexed to Massachusetts, only to be made a royal province again. In the war of 1812 with England the state refused to furnish its quota of militia.

The value of timber products has risen immensely. In 1850 it was $1,099,000, and in 1907 $13,082,000. The state to-day contributes $515,000,000 to the assets of the nation.

Business Institutions. The thinness and barrenness of the soil have stimulated the people of New Hampshire to efforts along other than agricultural lines, so that farm property, which was valued at $88,000,000 in 1880, in 1900 was valued at only $85,000,000 During the same period, however, manufactures almost doubled, the 1907 output being valued at $140,000,000.

The state is noted for the extent and variety of its manufactures, among which cotton, boots and shoes and lumber products are conspicuous. It leads the United States in production of maple syrup and sugar.

The population advanced from 350,000 to 430,000, exceeding by 50 per cent that of Montenegro, a famous European mountain principality. Rail Roads have increased from 1,015 miles in 1880 to 1,300 in 1910.



MAPLE SUGAR BUSH AND GRANITE QUARRY.

Vermont.

The Green Mountain State.

Discovered by Champlain, Vermont was first known as the New Hampshire grants, and took active part in the Revolutionary struggle. The famous "Green Mountain Boys" from this state, led by Ethan Allen, made the celebrated capture of Ticonderoga, almost without assistance. In 1791, notwithstanding opposition from New York, which claimed its ownership, Vermont was admitted to the Union as a state.

The value of the manufactured products was $31,000,000 in 1880, when the Rail Road mileage was 914; but in 1908, the number of line miles of Rail Road being then 1,071, the output was valued at $62,000,000.

In the same period the value of agricultural products jumped from $15,000,000 to $33,500,000. To-day there are 1,200 miles of Rail Road, the manufactured products have a value of $70,000,000 and the agricultural products of $40,000,000.

The Source of Sustenance.

The quarries of this state are very important, annually producing stone valued at $6,000,000.

The population has risen from 280,000 at the introduction of the steam horse in 1840 to 355,000, or as many people as in the republic of Costa Rica.

This little mountain state has approximately $400,000,000 to add as its contribution to the wealth of the nation.

PRESENT AND FIRST CAPITOL, VERMONT

RHODE ISLAND STATE CAPITOL

Rhode Island.

Size Only Incidental.

The smallest state in the Union has the longest name—in full it is the State of Rhode Island and Providence Plantations. Until a few years ago it had two capitals—Providence and Newport. The state is so diminutive that there are more than 600 counties in various states of the Union, each of which has a greater land area than its 1,053 square miles. Yet withal the state manages to pile up a very respectable total of wealth and leads the nation in the manufacture of jewelry and silverware.

Verrazano sailed along the coast of Rhode Island in 1524, but no permanent settlement was made until more than a century later.

Based on Freedom.

Roger Williams, banished from Massachusetts, settled with his Baptist colony at Providence in 1636, and granted absolute freedom of worship to all religions. The colony early became important.

In 1830, when the Railed Road first began to stretch its iron arms over the country, Rhode Island had a population of 97,000. By 1880 the Rail Road mileage had reached 210, and the population had grown to 276,531. Though no additions have since been made to the Rail Road mileage, except for the addition of an equal amount of electric mileage, the state has continued to grow, the presence of the Railed Roads enabling the state, by exchange of its commodities, to build the prosperity of the past and present.

Changing the Gauge.

The value of farm property has been decreasing for a third of a century, but the wealth of the state has grown wonderfully, manufacturing and commerce being the bases of the state's prosperity.

The population in 1910 of 542,000 is a growth of 439 per cent since her Rail Road era began. The wealth is placed at $850,000,000, a growth of $140,000,000 in a decade.

The value of the manufactures in 1880 was $104,000,000. By 1900 an increase to $185,000,000 (78 per cent) was shown, and another 43 per cent increase of the 1880 total has been added in

the last eight years, a recent figure being $230,000,000, with $250,000,000 as the estimate for 1910.

Its Proudest Boast.

Rhode Island almost might be tucked away in one's vest pocket. With one three-thousandth of the nation's area, it has three-fourths of one per cent of the wealth, and its manufacturing output is almost two per cent of the country's total.

Judged by proportionate area, it has 50 times its share of manufactures and 25 times its share of wealth.

The population of even this small state outnumbers that of the German duchy of Brunswick.

CAPITOL, CONNECTICUT.

Connecticut.

Derivation of Name.

Connecticut was one of the original 13 states, and with the exception of Rhode Island and Delaware is the smallest of our 48 empires. It takes its name from the stream of that name, which in the Indian language signifies "long river."

As the "wooden nutmeg and basswood ham state," and as the birthplace of "Brother Jonathan," Connecticut is noted. The state leads all others in the manufacture of plated and britannia ware, clocks, brass ware, corsets and fur hats, and what were formerly known as "Yankee Notions." The United States census reports ascribe Connecticut's leading position in manufactures in part "to its excellent communication by rail with all parts of the country."

Historical.

In 1633 the Dutch established a trading post at Hartford, but in a few years sold out to the English. In 1635 John Winthrop founded Saybrook. In 1637 New Haven was founded. The charter given to New Haven and Hartford by Charles II. in 1662 was demanded back in 1687 by Andrus, but it was hidden in the famous "charter oak."

Yale College was founded in 1700.

Connecticut ranks third in the United States in the number of inhabitants to the mile of Rail Road, having 999.

The Awakening Touch.

In 1790 the state had 237,000 inhabitants. In the next 40 years the population increased 25 per cent. Then came the Rail Roads, and in the first 15 years of Rail Road operation a growth of 75,000—31 per cent of the 1790 enumeration—was noted.

By 1860 the Rail Road mileage was 600 and the population was double the 1790 figure, less than 30 years of Railed Road having seen three times the increase of more than 40 years of the period leading up to the steel-ribbon era.

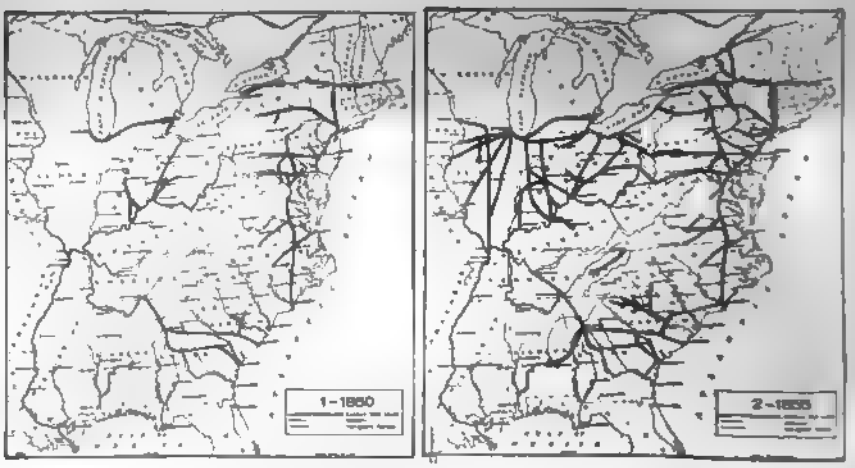
Population.

To-day, after 80 years of the iron horse's work, the mileage is over 1,000 and the population is 1,114,000, a 470 per cent increase over 1790, of which only one-eighteenth occurred in the years before 1830.

In 1880 the manufactured output of the state was valued at $185,000,000; this grew to $248,000,000 by 1890, and is approximately $400,000,000 to-day.

The Wealth of Nations.

In population this state, although but little larger than Montenegro in size, equals the republic of Uruguay, 18 times as large, and the wealth of more than $1,500,000,000 would almost liquidate the national debt of Spain.



Railways in United States 1850 and 1855.

THE CENTRAL NORTHERN STATES.

The Central Northern group, with an area of 248,000 square miles, is a great empire in itself The population has shown a twelve and a half fold growth since 1830.

The Rail Road mileage is equal to that of France, Italy and Belgium combined, with their 77,000,000 people.

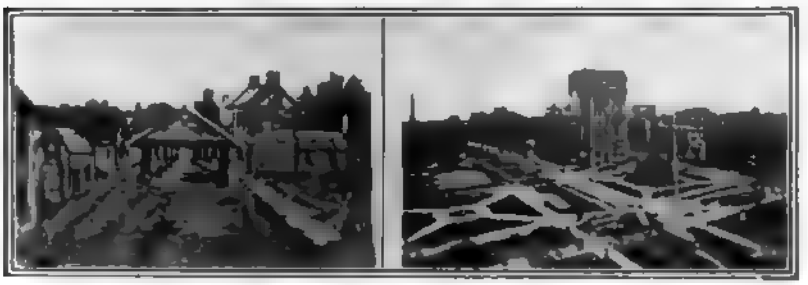
Ohio.

Ohio, the Buckeye State, was explored by the French early in the 17th century. The first real settlement was in 1788 at Marietta. The so-called Northwest Territory was ceded to Great Britain by France in 1763 and became part of the province of Quebec, although the colonies of Virginia, Massachusetts, New York, Connecticut and Maryland each claimed it.

1776. When the Revolution broke out the great pioneer, George Rogers Clark, of Kentucky, which was then part of Virginia, captured several posts in this region and the inhabitants thereupon recognized themselves as subjects of Virginia, which state proceeded to make the entire region west of the Ohio "the county of Illinois." When the treaty of peace with England was signed the territory was included in it, but the British did not evacuate until 1795. From this Northwest Territory Ohio was formed, becoming a state March 1, 1803.

The Ohio Valley of Yesterday. If we compute distances by the time and expense of transportation or communication, Sitka, Alaska, to-day is as near Philadelphia as Cincinnati was in 1790.

At that time General Harmar, who had been dispatching a boat once a month from Cincinnati 500 miles up the Ohio to Pittsburgh to a post-office, found it cheaper to send letters by private messenger to Danville, Kentucky, and thence over the mountains to be mailed at Richmond.



CHILLICOTHE IN 1810, AN IMPORTANT OHIO TOWN

THE HEART OF CLEVELAND, POPULATION 560,663, 1910.

The first Iron Road in Ohio was finished in 1836; it extended to the Michigan frontier, being 36 miles long. Toledo then had 2,000 inhabitants; to-day there are 168,000.

Cleveland and Cincinnati. Joseph Cleveland settled at the mouth of the Cuyahoga river, the site of the present city of Cleveland, which takes its name from him. Four years later, in 1840, this town had 6,000 people. Its population now is 560,000. For every person in the city of Cleveland then there are 93 to-day.

Cincinnati marks a wonderful development, for since the beginning of the 19th century it increased in population fully 400-fold.

Following the Magic Wand.

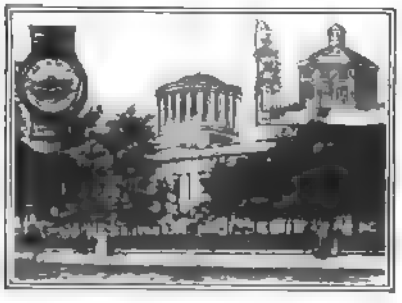
The growth of these cities and of the state seems to have followed the introduction of iron-wheeled transportation, proven by the fact that while Ohio had perhaps 581,000 inhabitants in 1820, there are over eight times as many to-day, or 4,767,000; in other words, it has doubled its then population every 10 years; that while its coal output was practically nothing as late as 1850, and 5,000,000 tons in 1880, it was 32,000,000 tons in 1909; that the pig iron output has increased in the 10 years from 1897 to 1907 from 1,300,000 tons to 5,250,000. There are practically 10,000 miles of Rail Road in the state.

The manufacturing industries of the state appear to have benefited by the Railed Roads. Ohio was an agricultural state when the Rail Road came. Improved transportation, as always, resulted in manufacturing being fostered and stimulated, and in 1910 the output of the 14,000 manufacturing establishments in the state exceeded $1,100,000,000 in value, or more than all the gold and silver in circulation in the United States.

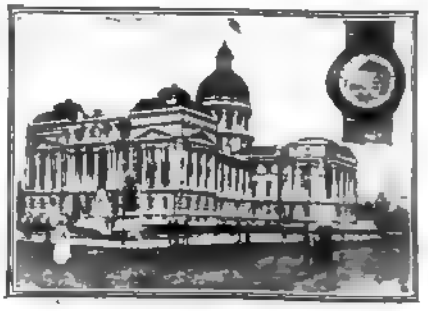
"The Riches of His Kingdom."

In 78 years the Rail Roads have aided in bringing forth an empire with a population as great as that of ancient Scotland. Ohio's wealth, $6,500,000,000, is considerably greater than that of the kingdom of Spain, while in size the state is 20 per cent greater than the republic of Portugal.

So when we are thinking of the countries of the earth, we can remember that if the new Ohio were an independent nation she would take rank with some of the old nations of the earth.



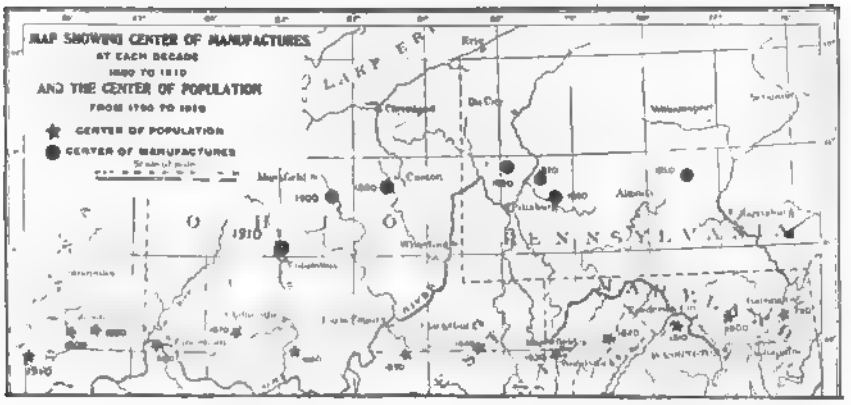
PRESENT AND FIRST OHIO CAPITOL.



INDIANA STATE CAPITOL.

Indiana.

Indiana holds a prominent place in the galaxy of American empires: the state is eighth in manufacturing, and ninth in agriculture and population.



THE MOVEMENT WESTWARD OF THE CENTER OF POPULATION.

Two Hundred Years Since. The Hoosier state was originally a part of the Northwest Territory. The first settlement was made by the French in 1702, at Vincennes. So feeble was the early life of the region that this territory was a hundred years old before it mustered a population of 5,621.

On July 4, 1800, Indiana Territory was organized, and "Tippecanoe," or William Henry Harrison, became the first governor.

Difficulties Overcome. The state has grown in value from practically nothing 100 years ago to a wealth of considerably over $3,000,000,000, even though it has experienced the drawback of passing through bankruptcy.

In 1850 Indiana had 300 miles of Railed Road; in 1860 the mileage was 2,100, and further construction went on rapidly. To-day there are 7,800 miles, more than enough to stretch from Indianapolis to Alexandria in Egypt.

Manufacturing. The output of the glass industry was valued at $2,900,000 in 1880; 10 years later this had risen to 500 per cent of its original output, or to $15,000,000. The lumber products of the state are worth $20,000,000. In 1880 the coal output was 1,000,000 tons. In 1890 this had increased to 3,600,000 tons, and in 1907 to 12,000,000 tons, or as much a month as it had been in a year. The coal beds are of vast extent, the supply being estimated at 50,000,000,000 tons.

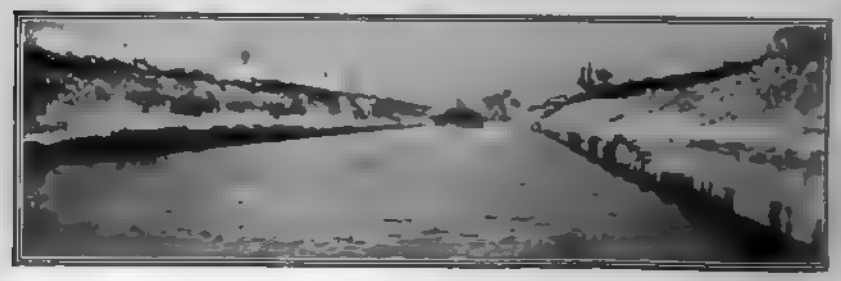
In manufactures, $325,000,000 is invested, the annual output being valued at $400,000,000.

Interesting Information. Indiana produces almost 50,000,000 bushels of wheat annually; in 1880, when there were but 4,300 miles of Rail Road where to-day there are 7,800, the wheat crop was but 20,000,000 bushels. In 1890 the value of all farm products was $94,000,000; in 1900 this had increased 120 per cent to $205,000,000, while in 1908 farm products were valued in excess of $250,000,000.

The wealth of the state surpasses $3,500,000,000, or that of the kingdom of Norway, while his excellency, the governor of Indiana, is a bigger man than the President of Peru, judged by the standard of the number of persons—2,700,000—he is elected to govern.

Illinois.

Exploration. The first Europeans to visit the Illinois country were Father James (Père) Marquette and Louis Joliet, in 1673. Earlier explorers knew of the Illinois country, and many historians assert Jean Nicolet visited it; it is certain that he traded with the Illinois Indians at Green Bay. In 1679-80 La Salle and Hennepin entered the Illinois river by way of the Kankakee; and the former named it after the allied tribes inhabiting the region.



THE CHICAGO DRAINAGE CANAL.

The Prairie State. Illinois has always been called the Prairie State, and well deserves the title. The territory which is now the state of Illinois formed part of the Northwest Territory, which belonged to France by right of discovery. It became a part of the English colonial possessions after the French and Indian war.

It passed through no less than three territorial stages, being successively a part of the Northwest Territory, a part of Indiana Territory and of Illinois Territory, until 1818, when it was admitted into the Union.

Forging Ahead. In 1830 the population was 157,445; the state census of 1835 showed 269,974 inhabitants, or nearly double the previous number. The increase was mainly in the central and northern parts of the state, the Black Hawk war having advertised these fertile regions throughout the nation.

Up to 1840, the time of the introduction of the Rail Road into Illinois, the state had less than 500,000 people. By 1850 it had 111 miles of Rail Road and the population had increased to 850,000, or 70 per cent in 10 years. The next 10 years saw the mileage increase to 2,600 miles of road, and the state's population doubled, increasing to 1,711,951.

Progress. In 1910 the population was 5,638,000; the state's Rail Road mileage is now 14,000, exclusive of 8,500 miles of side track and second, third and fourth tracks, and the 1,500 miles of electric Rail Road. If placed in a single line the Rail Road trackage of Illinois alone would reach nearly around the earth at the equator, or give almost eight transcontinental lines.

Stupendous Industries. Illinois has become the most important manufacturing state west of the Alleghenies, the value of manufactured articles in 1905 reaching $1,410,000,000. The meat and packing-house products alone in 1900 were worth $256,000,000, not including the output of apparently so insignificant an industry as soap and candle-making, which amounted to more than $10,000,000.

During the period from 1880 to 1890 the value of the mineral output rose from $10,000,000 to $28,000,000. In 1907, 17 years later, the output was valued at $152,122,648, the value of the coal alone in 1907 being $54,000,000.

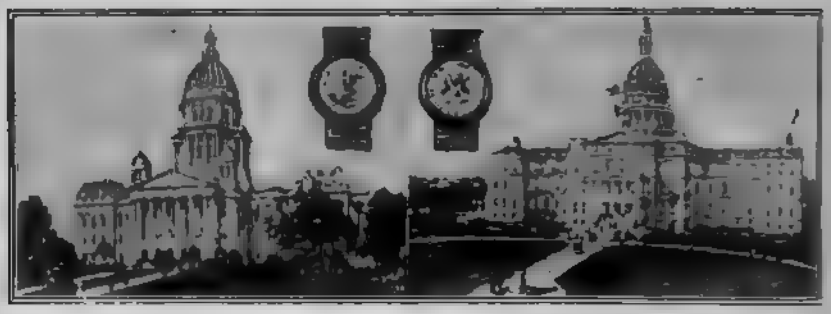
The state plants annually about 7,000,000 acres in corn and 1,000,000 acres in wheat.

CHICAGO, 1845.

A Magic City. That modern miracle of cities, Chicago, has grown from the Fort Dearborn of 1830, with 70 people, at the dawn of Rail Road building, to the greatest grain market and sixth largest city in the world, with a population of 2,185,000, having added the 1830 population an average of every day since. As late as 1837 Chicago was a village with a population of 1,470, and had to have a garrison for its protection.

Prosperous Communities. Along with the development of Chicago, other cities have sprung up, such as Peoria, Joliet, Rockford, Springfield, East St. Louis and Elgin, all of them born from the womb of traffic and modern progress.

The population of the state is equal to that of the kingdom of Sweden, and its area equals the combined areas of Greece, Servia, Belgium and Denmark. Its wealth, $9,000,000,000 in round numbers, is four times the wealth of the republic of Switzerland.



CAPITOL, ILLINOIS. CAPITOL, MICHIGAN

Michigan.

Position Favorable.

Owing to her peninsular formation and extensive shore line on the Great Lakes, the Wolverine State early became a seat of trading for the French and later for the English. It was visited in the early 17th century by the pioneers, Grosslier, Pere Marquette and Du Luth.

The territory was formed from the Northwest Territory on January 11, 1805, and in 1837, seven years after the Baltimore & Ohio began its work of reaching out toward the west, Michigan was admitted into the Union as a state.

Detroit a Trading Post.

At that time Detroit was still a trading post, with 8,000 people. This trading post has become a metropolis of 465,000 people. The state, since 1840, or almost in the winking of the eye of time, increased her population from 32,000 to 2,810,000, greater than that of the troublesome child of Europe—Servia.

The state early began the construction of three lines of Rail Road across her territory; of this we treat in another chapter. Until the Rail Roads were completed, mail matter was brought in coaches, the charge for a letter being 25 cents from Detroit to Pontiac and other points.

In Manufacturing.

Michigan has already invested $338,000,000 in her manufactures, almost the same amount as has the much older state of Connecticut. The output of the manufacturing plants is placed at $430,000,000 yearly. Michigan makes 45 per cent of the nation's automobiles.

Michigan has become the third largest producer of copper and lumber in the United States, the second in the development of her mineral resources and the first in salt, all of which followed the introduction of modern means of transportation.

Three Thousand Millionaires.

The value of the property of the state is now $3,600,000,000, as much as the long-established kingdom of Belgium. Michigan has 28 cities of more than 10,000 inhabitants each.

The Rail Road mileage, despite the fact that Michigan is a double peninsula, is 9,000 miles, sufficient to construct a single track Rail Road from New York City to the capital of Michigan—Lansing—and thence by the projected "Three Americas" route to Buenos Aires, the capital of Argentina.

Wisconsin.

The Foundation. Wisconsin was discovered by Nicolet in 1634, and a settlement of French traders was made in 1639. It became a territory in 1836, and was admitted to the Union in 1848. Wisconsin was the last state formed out of the Northwest Territory.

The snort of the steam horse was not heard in Wisconsin until 20 years after it had begun to echo and re-echo through the forests of our Eastern states.

In 1850 the state had 20 miles of Rail Road, which in 1870 had grown to 1,525 miles. In 1909 there were 7,800 miles of Railed Roads.

State Normal School, Stevens Point, Wis. One of Wisconsin's several Normal Schools.

The First Rail Road. It was not until 1857 that the first important road, the Milwaukee & Waukesha, running direct from the Lakes to the Mississippi, and touching Madison, the capital, was completed. It was from a Wisconsin charter that the great Chicago, Milwaukee & St. Paul has grown

In 1840 the present city of Milwaukee, the metropolis of the state, had a population of but 1,700. This village, in rapidity of growth since, rivals the beanstalk of Jack the Giant Killer, for its present population is 373,000

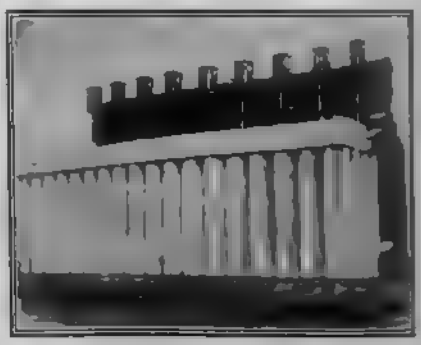
A Trading Place. The flour trade of that early day, to say nothing of another industry that "made Milwaukee famous," has also grown. The latter industry alone is said to ship ten million packages of its goods over the Rail Roads in prosperous years. The manufacturing output of the state is $1,500,000 a working day, or about $500,000,000 a year

The Rail Roads centering at the twin cities of Superior and Duluth have enabled the economical development of the greatest iron deposits in the world, and have brought enough traffic from a single tier of states to make the latter the largest port on earth.

Greatest Port on Earth.

The freight traffic passing through the great Federal Ship Canal at Sault Ste. Marie—50,000,000 tons, with a valuation of $500,000,000—incredible as it may seem, is much greater than that passing through the Suez Canal, which is the greater portion of the trade between hundreds of millions of people of the Orient and Europe

CAPITOL, WISCONSIN



STEEL GRAIN ELEVATOR, SUPERIOR, WIS

The population of Wisconsin in 1830 was not more than 1,000 chiefly trappers and fur traders. In 1840 the population—30,000—was the smallest of any state in the Union, despite Wisconsin's lake situation and water transportation facilities, for it has the benefit of three of our water ways, including two Great Lakes, upon its borders. The population in 1910 was 2,333,000.

Maintaining Four Britains.

The wealth of Wisconsin, created in a hand span of time, is $3,000,000,000, almost four times the revenue of the United Kingdom and colonies.

When we are thinking of republics, we can see how many of them are represented or duplicated in the population of the Badger State by finding that the population of this state is equal to the combined number of inhabitants of the five American republics, Paraguay, Honduras, Nicaragua, Dominican Republic and Costa Rica. The area, 56,066 square miles, is equal to that of England and Wales combined.

GULF AND MISSISSIPPI VALLEY GROUP.

The Gulf and Mississippi Valley group grows all temperate and many tropical zone crops, is rich in all minerals, and it has been said frequently that a wall could be built around the group, isolating it from the rest of the world, yet the inhabitants would have to forego none of the necessities and few of the luxuries of life. The popula

tion has grown five-fold since the Railed Road came, whose mileage almost equals that of Great Britain, which serves 42,000,000 people.

Kentucky.

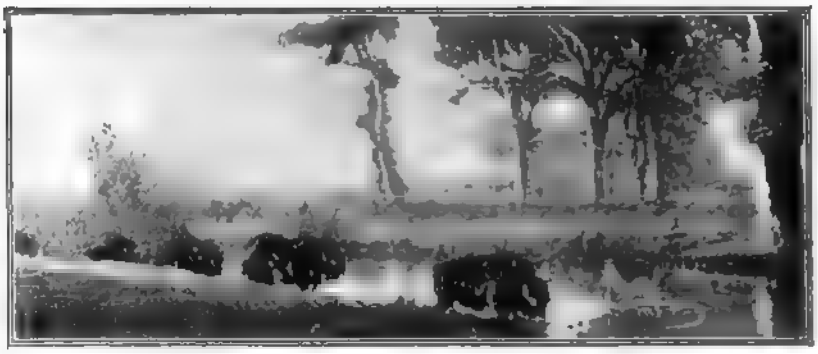
Settlement of Kentucky.

Kentucky is a state whose marvelous recent development may be largely traced to the helpful influence of the steel cyclops. The first exploration was in 1767 by John Finley—followed two years later by Daniel Boone and others from North Carolina.

Daniel Boone.

In 1775 Daniel Boone, representing Col. Richard Henderson and his colony, bought 17,000,000 acres of land from the Indians for £10,000, paying, therefore, thirty-three cents in trade for each thousand acres. This was paid mostly in beads and the like, but even under such conditions it was considered a most munificent and liberal price for land in those days.

Notwithstanding the purchase of the land, however, there were many bloody encounters with the Indians. The territory was made a part of Virginia and was admitted to the Union in 1792. The wealth of the state is given as $1,700,000,000.



Watering at sunrise, an early Kentucky scene.

The First Rail Road.

Kentucky was five years ahead of Ohio, getting her first Rail Road in operation in 1831. The Lexington & Ohio Rail Road was the first west of the Alleghenies and south of the Ohio. Henry Clay was the leading spirit in this enterprise.

Mules furnished the motive power at first and each car accommodated four passengers, provided two of them did not object to riding backwards.

Pioneers of Progress.

In 1833 a Lexington mechanic made a curious contrivance which he called a "steam motive power," which, with half a dozen cars attached, went out on a trial trip, while all Louisville stood around and envied the fortunate few aboard. When the train got about four miles from town snow began falling, and the machine refused

to go farther. The passengers had to foot it back to town, to the intense enjoyment of those who had been left behind.

Sixty Years Ago.

In 1850 the Rail Road mileage of Kentucky was 58. By 1880 this had increased to 1,500, and the state henceforth loomed large on the industrial, commercial and agricultural horizon. In that year the value of all farm property in the state was $350,000,000, the manufactured output was valued at $75,000,000 and the lumber output at $5,000,000. The coal production reached 850,000 tons.

By 1900 there were 3,000 miles of Rail Road, a 100 per cent increase in 20 years, and the value of farm property was placed at $475,000,000. The manufacturing output showed a 110 per cent increase to $155,000,000; lumber increased 140 per cent, and coal jumped 560 per cent to 4,750,000 tons.

The Riches of a Kingdom.

The value of farm property has since then leaped to $600,000,000; manufacturing shows an advance to $200,000,000, and lumber to $20,000,000. The coal output has to its credit an advance of 1,150 per cent over 1880, the 1907 output having been 9,650,000 tons. The Rail Road mileage is 3,500.

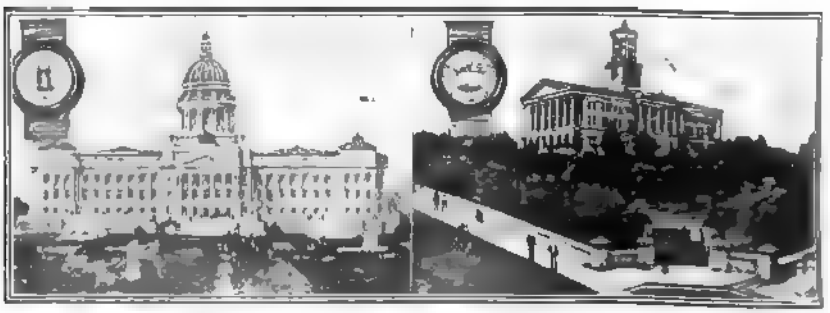
The population of the single state of Kentucky of 2,289,000 is as great as that ruled over by the king of Wurtemberg, or his majesty the king of Greece, and the state's wealth is greater than that of the republic of Portugal. So why should not the governor of Kentucky rank with the rulers of these nations?

Tennessee.

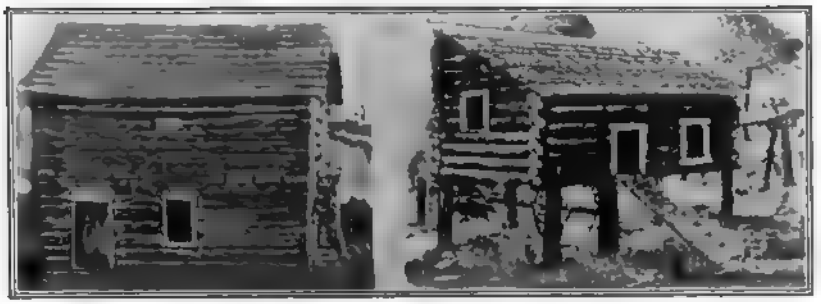
The "Volunteer State."

Tennessee and Kentucky came into existence and power at the same time, but the former furnishes the peculiar instance of growth from two widely separated centers.

The pioneers who settled Tennessee, it has been aptly said, were the first Americans who moved into the wilderness as a body and hewed homes for themselves, wresting the land from its savagery



CAPITOL, KENTUCKY CAPITOL, TENNESSEE.



CAPITOL OF THE STATE OF FRANKLIN, PRECEDING TENN.

FIRST GRIST MILL IN TENN., JONESBORO.

In 1769 settlements were made around the headwaters of the Tennessee River, the settlers believing they were in Virginia.

The Watauga Association.

In 1771 they discovered the settlement to be south of Virginia, and therefore not protected by the treaty with the Indians, so they organized a government the next year under the name of the Watauga Association. It was these Watauga settlers who, at King's Mountain, defeated Ferguson's men, making the surrender of Yorktown possible.

In 1776 the territory was annexed to North Carolina.

The State of Franklin.

In June, 1784, the North Carolina legislature, following many bickerings and contentions, ceded the section to the Federal Government. The cession was not acted on by Congress and the settlers held a convention and declared themselves independent, organizing the State of Franklin.

Fiscal Mediums.

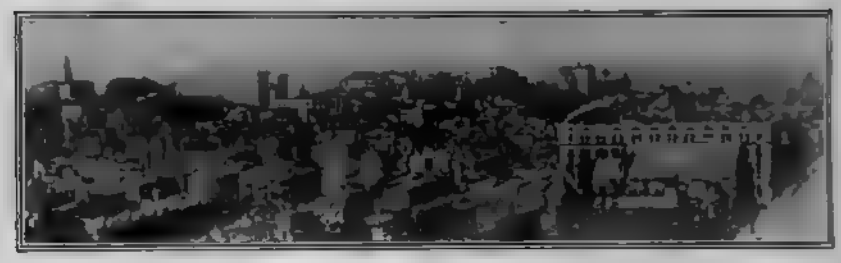
The governor and many other state officials received their salaries in skins and furs. An otter, beaver or deer skin was declared equal to six shillings, and a raccoon or fox skin to one shilling three pence. It was provided also that bacon should be a legal tender on the basis of six pence a pound, and rye whiskey at two shillings and six pence a gallon.

After a stormy four-year existence the state of Franklin collapsed. North Carolina resumed control and held it until 1796, when the state was admitted as the 16th to the Union.

Undeveloped.

Tennessee made little progress until better carriage came, when her forests and farms began to yield wealth and her rocky hillsides to give up their stores. Tennessee is one of the few states in which every geological formation and every mineral are found. Coal, iron, phosphate rock, marble, lead, copper, zinc and several others are worked.

In 1860, when the state had 1,253 miles of Rail Road, the population was 1,100,000, almost double that of 1830. The cotton crop, meanwhile, had increased from 30,000 bales to 300,000.



BIRD'S-EYE VIEW OF NASHVILLE.

Astounding Industry.

In 1880 the state had 1,900 miles of Rail Road, and the value of all farm property was $250,000,000. In that year 440,000 tons of coal and 150,000 tons of pig iron were produced. To-day the state has 4,000 miles of Rail Road, produces more than 6,000,000 tons of coal, 400,000 tons of pig iron and 400,000 bales of cotton, the latter valued at $20,000,000. The value of all farm property is placed at $350,000,000.

The population of Tennessee has grown from 600,000 in 1830 to 2,184,000 in 1910, and the value of the annual output of the state's factories has increased 1,400 per cent—from possibly as much as $10,000,000 in 1860 to $150,000,000.

Cuba Outdone.

The area of the state, 33,000 square miles, equals that of Cuba; her population is equivalent to the number of inhabitants of Madagascar, and her wealth almost equals that of Switzerland.

Alabama.

Lengthened 2,700 Per Cent.

Alabama in 1850 had 183 miles of Railed Roads. To-day there are 5,200 miles of such inland transportation means.

De Soto passed through this region in 1540, previous to his discovery of the Mississippi. At that time there were many Indians in the territory, and in that tongue, Alabama means "Here we rest!"

THE FIRST HOUSE AND A PRESENT VIEW OF BIRMINGHAM'S BUSINESS SECTION. POPULATION IN 1890, 38,415, IN 1910, 132,685. AN EXAMPLE OF THE PROGRESS AND PROSPERITY OF THE NEW SOUTH

Joining the Union. The territory, which from 1798 had been part of the Mississippi territory, joined the Union as a state in 1819.

The population in 300 years grew to a little over 600,000 at the beginning of the Rail Road era, which population it then added practically every 30 years, there being 2,138,000 inhabitants in 1910.

Rapid progress has been made in various industries since the real expansion of Rail Way mileage in 1880. For instance, $2,000,000 worth of bituminous coal was mined in 1880; in 1907 the coal product was valued at $8,600,000. The coal fields cover an area of 5,500 square miles, almost as much as the total of Connecticut and Rhode Island combined. Of the estimated original coal supply of 68,903,000,000 tons, only one four-hundredth part, 165,000,000 tons, has been mined.

Extent of Iron Region. Alabama's production of iron is second only to that of Pennsylvania. In 1907, $28,450,000 was the value of the pig iron output. The area of the known iron ore fields is 7,600 square miles, exceeding the land area of the state of New Jersey.

The state is fourth in the production of cotton, 35 per cent of the improved land being devoted to that staple. In 1908, 1,400,000 bales were raised, valued at $68,000,000. The cottonseed oil and cake production was valued at $10,000,000 more.

In 1908, 45,000,000 bushels of corn were raised. The lumber output in that year was valued at $20,000,000. The value of all manufactured products is about $70,000,000.

Industrial Centers. Birmingham, Mobile, Montgomery and Sheffield, with tens of thousands of people, teeming with life and activity, are only a few of the cities which have multiplied in population, increased in size and enlarged their commerce many times since the iron horse linked them together.

It is difficult to realize that Alabama equals in population the South African Transvaal and Orange Free State, British Guiana and Newfoundland.

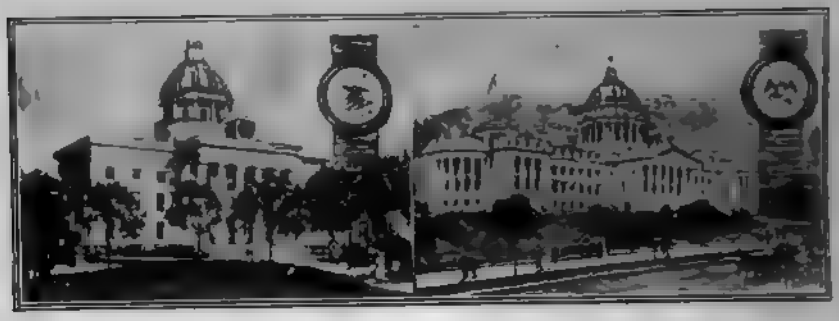
Alabama is already a billionaire and the state covers as large an area as Nicaragua.

Mississippi.

Mississippi's present annual cotton crop equals the entire crop of the nation in 1840, and exceeds the crop of the year in which the Baltimore & Ohio was opened.

Facilities of Nature. Despite her great river, in few of our empires have the Steeled Roads played as important a part as in the "Bayou State."

An increase in population from 75,000 in 1820, just previous to the introduction of Steam Roads in the United States, to 1,797,000 to-day, is one phase of the story.



STATE CAPITOL AND GREAT SEAL, ALABAMA. CAPITOL, MISSISSIPPI.

Chronology. De Soto explored the region in 1539, and Joliet and Marquette floated down the Mississippi river in 1673. The state was settled in 1699, when 200 Frenchmen formed the first colony in that part of America. Mississippi was organized as a territory in 1798. Until then it had been part of Georgia. In 1817 it became a state.

Artificial Means Needed. The state has no metropolis and is largely agricultural, the largest cities having but 15,000 population and the capital, Jackson, only 7,500.

Its real markets are in other states, and Steam Road transportation has been largely instrumental in bringing the state into touch with them, thus contributing to the welfare of the commonwealth.

By 1860 Mississippi had 850 miles of Rail Road; to-day it has 500 per cent as much, or 4,200 route miles, an average of nine route miles as well as several miles of side track to each section of the state 10 miles square. This line mileage, all within her borders, equals the distance from New York City to Berlin, Germany.

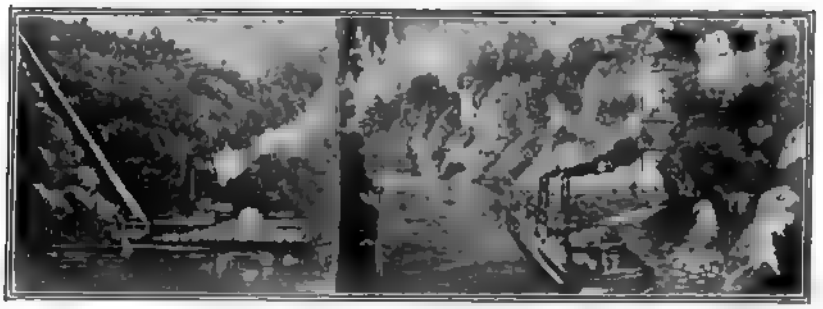
How Values Have Risen. Since 1880, when the Rail Road mileage was 1,100 miles, the value of farm property has increased from $120,000,000 to $250,000,000, and the improved land from 5,000,000 to 8,000,000 acres, the Rail Roads having brought 3,000,000 previously almost valueless acres into touch with the markets of the world.

Almost 2,000,000 bales of cotton are produced annually, valued approximately at $100,000,000. In 1880 the crop was but 800,000 bales.

The manufacturing has greatly increased of late. The value of these products was $7,000,000 in 1880; by 1905 it was over $57,000,000.

Overshadowing Population. How important is Mississippi is gathered from the fact that her people substantially equal the combined number of inhabitants of our antipodal neighbors of New Zealand, Tasmania, Queensland and Hong Kong.

At the same time, her territory of 46,865 square miles is fully 30 per cent larger than the republic of Portugal.



A COTTON CHUTE. LOADING COTTON BY ANOTHER METHOD.

Louisiana.

Founding an Empire.

Louisiana, the Creole State, was discovered by Fernando de Soto in 1541. Chevalier de la Salle, in 1682, named it for Louis XIV., king of France. At different periods it was under the dominion of the French, the English and the Spanish, and at one time it was controlled by John Law, of "Mississippi Bubble" fame.

The First Settlement.

In 1699, at Biloxi, was founded the first settlement. In 1712 the commerce of Louisiana was granted to Anthony Crozat, a French merchant. Crozat surrendered it in 1718, and the Mississippi Company then received the privilege, but after 14 years also gave up its rights.

In 1763 France ceded Louisiana to Spain. A revolt against Spanish rule began in 1766 and was put down in 1769 by the Spanish general, Alexander O'Reilly.

Bought by United States.

Spain, in turn, secretly ceded it to France, and in 1803 the United States government purchased the territory from the French for $12,000,000, and assumed claims aggregating $3,750,000.

IRRIGATION PUMPING PLANT FOR RICE FIELDS.

Louisiana was admitted to the Union in 1812. In its early history, for a period of 260 years, it had gained population at the rate of less than two persons a day, the population in 1803 being 150,000.

Responsive to the Touch.

The first Iron Roads were built between 1840 and 1850; in the latter year the state had 80 miles of Railed Road and a population of 500,000, which was an increase over 1840 of 150,000, or 41 persons a day.

To-day there are 5,000 miles of Rail Road and the population has increased to 1,656,000, or at the rate of over 50 persons a day since the Railed Roads began.

Vast Tracts Producing.

A million and a half acres are devoted to the raising of cotton, and the crop ranges between 750,000 and 1,000,000 bales a year, six or eight times the crop of 1850.

Over one-third of a million acres are given over to sugar-cane culture, producing annually 750,000,000 pounds of sugar and 25,000,000 gallons of molasses and cane syrup.

The Farm.

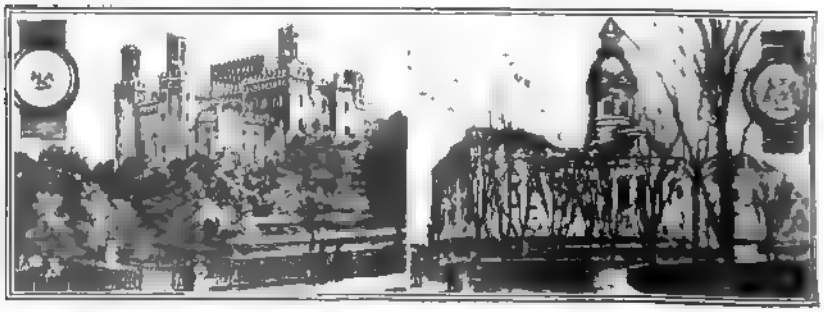
In 1907 returns from sugar and syrup aggregated $50,000,000, more than four times the $12,000,000 return of 1890. More than 30,000,000 bushels of corn were raised in 1907 on 1,400,000 acres. Since 1880 the value of farm property in the state has increased from $58,000,000 to above $200,000,000, largely the result of gridironing the state with steel and improved transportation service.

The value of the manufactures of the state is another tidy sum the output of 1910 being valued at $186,500,000.

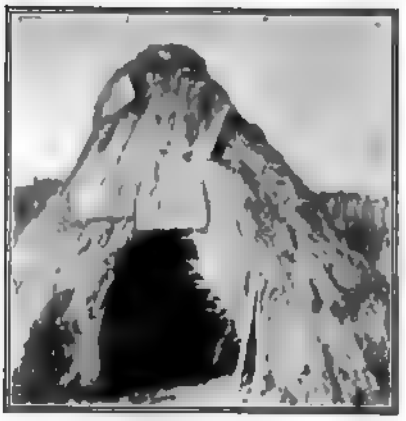
Powerful and Wealthy.

Louisiana's wealth, $1,300,000,000, is almost that of Greece, which centuries ago saw the rise and fall of Rome. Her population equals that of Cuba, and her 50,000 square miles of territory is almost as much as that part of Turkey which lies in Europe.

The principal city, New Orleans, by virtue of its large population and commercial greatness, ranks among the few cities which may be said to have international importance.



STATE CAPITOL, LOUISIANA — MISSOURI'S CAPITOL



AN ABORIGINAL "SKYSCRAPER."

MODERN SKYSCRAPERS, ST. LOUIS

THE SOUTHWESTERN GROUP OF STATES.

The Greatest of Empires.

In area the Southwestern group is the largest of the groups of states into which the nation is popularly divided. Its area of 767,000 square miles is within five miles of that of the 27 states, three territories and one federal district of the republic of Mexico.

The population has grown more than 50-fold since the dawn of the Rail Road day. The population of the kingdom of Spain, which once claimed this portion of America, is to-day outnumbered by the inhabitants of this section, only one of eight of our groups.

The Systems of Two Nations.

There are, in round numbers, 50,000 miles of Rail Way in the group, enough to duplicate the systems of France and Great Britain, while the wealth would liquidate the national debts of Russia, Great Britain and France.

The story of Oklahoma, one of the members of this group, is told further on under the title, "A Miracle of Miracles."

Missouri.

The Conditions of Yesterday.

Less than 80 years ago the great city of St. Louis, now the fourth largest in the country and one of the great cities of the world, was little more than a trading post with between 5,000 and 6,000 inhabitants. Five years after the completion of the Ohio & Mississippi, St. Louis' population had increased to 150,000, and to-day she extends 18 miles north and south along the river and has a population of 687,000. She is second only to Chicago as a Rail Road center of the nation.

Missouri was one of the first states west of the Mississippi to discuss Rail Road building. Not until 1847, however, was the Ohio & Mississippi Rail Road commenced, and it was not opened until 1853.

The Iron State.

Missouri, formerly called the "Iron Stat included in the Louisiana Purchase, and settled by the French. Organized as a ter 1812, it was admitted as a state in 1821.

When the first blasts of the locomotive whistle were wa forests of Maryland, St. Louis controlled the line of overlanc communication with the distant Rockies, and became prom the history of the "westward" movement.

Revolutionizing Facility.

The welding of the connecting link betv east, south and west by a bridge spanr Father of Waters was one of the great ments of the age. It took place July 4, 18 the great Eads bridge at St. Louis was opened at a cost, i purchase of the site and property damage, of $12,680,00(then this investment has been increased, until to-day it is sc like $25,000,000.

This bridge was immediately appreciated as a factor of ance, giving, as it did, direct rail communication between tl ent sections of the country, eliminating the Mississippi as a between the hitherto separated East and West.

We Point With Pride.

Missouri has just reached the age of ninet yet its Rail Road mileage is 8,700, its po equals that of Bulgaria, and the wealth of t incredible as it may seem, is more than much as the annual revenue of all the countries of the world

OLD AND NEW STATE CAPITOL, ARKANSAS. AN EXAMPLE OF RECENT PROSPI

Arkansas.

The Necessary Influence.

Arkansas was formerly a part of Missou tory. It was 1861 before the first Steam R in Arkansas, although it had become a state 25 years before. Her subsequent developm been rapid, and each extension of modern land transporta been accompanied by additional commercial, industrial, agri and mineral developments.

In 1890 the Rail Road mileage was 2,100, to-day there proximately 5,000 miles of Rail Road in the state, sufficient

more than four Rail Roads from our inland seas, the Great Lakes, to the Gulf of Mexico.

Progress Everywhere.

The value of timber products in 1890, for instance, was $8,000,000; 10 years later it was $24,000,000; in 1907 it had jumped to $33,000,000. The population has shown a very large increase. The 30,000 of 1830 had leaped to 1,128,000 in 1890, a 40-fold increase in 60 years. To-day there are 1,574,000 inhabitants in the state.

The extent of the manufactures of the state was scarcely worthy of mention until the steam Road began to stretch itself over the state. In 1905 the output of the manufacturing industries was valued at $54,000,000, an increase of 35 per cent in five years. The farm products of the state add $100,000,000 to the nation's production each 12 months.

Natural Wealth.

Coal is extensively mined. The Ozark region grows some of the choicest fruit in the world. In 10 years the value of the cotton crop has doubled, the 1908 crop having been valued at $53,000,000.

Arkansas can produce an inhabitant for each man, woman and child in the German principalities and states of Mecklenburg-Strelitz, Saxe-Meiningen, Anhalt, Saxe-Weimar and Oldenburg. Thus we have in our midst a state not well known, yet equal in population to five of the world's oldest grand duchies and principalities.

EARLY KANSAS HOUSE AND SCHOOL MADE OF SOD BEFORE LUMBER WAS AVAILABLE.

Kansas.

Three Kingdoms in Size.

Kansas is the geographical center of the United States proper. It has an area of 82,000 square miles, equal to the combined areas of the three kingdoms of Greece, Belgium and Roumania.

It was 1865 before the mighty rush of the iron horse carried it into the northeastern portion of Kansas, at which time there was only one inhabitant per square mile in what is now the state.

A Wilderness Uncarved.

Men did not dream then of the value of the millions of tons of coal, of lead and of zinc; of the great quarries of building stone and cement rock; of the fields of oil and gas, exploited since modern carriage came to Kansas.

At that time the greater part of the land could have been had almost for the asking, and the price of a single acre in some of the older states would have secured at least 150 in Kansas.

Modern Transportation.

Soon there was tremendous activity in t
Road field; from being without a single
track in 1860, Kansas gained no less tha
miles of Railed Road, equal to the distan
her state capital to Manila, in the Philippine Islands.

Doubling Each Six Months.

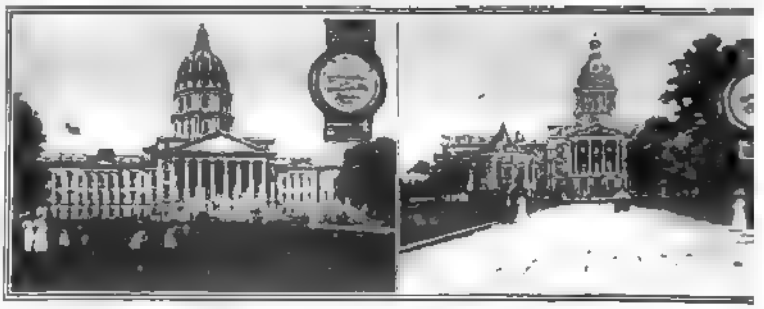
In 1870 the population already numbered
and 20 years later a 15-fold increase over
enumeration was recorded. The wealth
000,000 of 1860 had grown to $2,253,224
1904, a gain every recurring six months equal to the entire
44 years before.

One hundred million dollars is invested in manufactur
the output annually exceeds $200,000,000.

A Nation's Ransom.

A man of middle age could have seen the r
state as great in point of population as Als
Lorraine, over the possession of which two
powers fought bitterly; while the wealth
state, $2,250,000,000, is more than the purchases of the entir
from the United States in a year.

The citizen of Kansas may well hold his head high as he
the marvels that the brief history of the Jay Hawker State r



CAPITOL, KANSAS. CAPITOL, NEBRASKA

Nebraska.

Her Explorers.

Nebraska was a part of the Louisiana Purcl
1803, and Meriwether Lewis and George
Clarke in 1804-5 were the first white men
it. It became a territory in 1854 and a state in 1867.

Early pioneers and ranchmen had no thought of per
residence, and paid no attention to farming. Fifty-five year
the visit of Lewis and Clarke the population was 28,000.

Double Every Ten Months.

Forty years after the Steam Road entered th
the population had increased to 1,192,000,
times.

Some one has said that the farmers won
"smothered in their own grease and burned Indian corn f

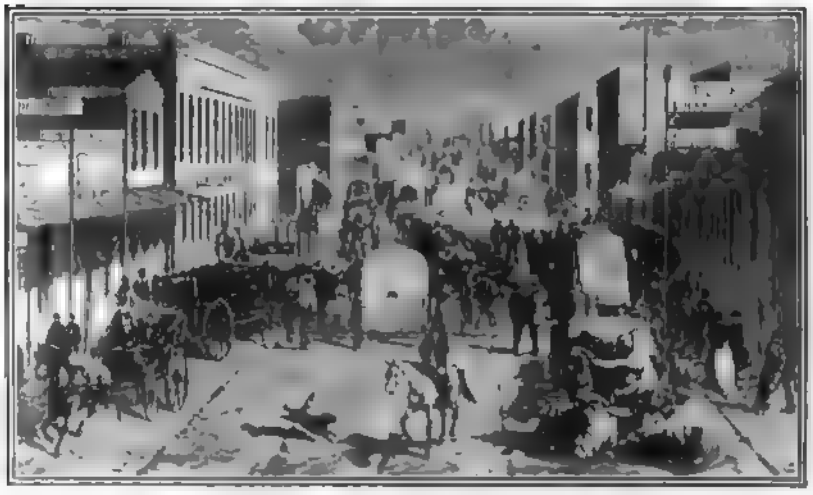
until this day had it not been for the advent of better land transportation."

The Fear of Indians. Until the Railed Roads came, farming operations were practically limited to the territory on either side of the Missouri; beyond that only stock raising was possible. For 20 years this and the danger from Indians prevented the population from increasing, until at last the Union Pacific was completed, 40 years ago.

In 1872 there were only 24,000 acres of land under cultivation. To-day there are five times as many farms as there were then acres under cultivation, there being nearly 125,000 farms now with an aggregate of 35,000,000 acres.

A Great Center. As an example of the growth of this state, it is interesting to note that as late as 1863 Omaha was a settlement of less than 2,000 inhabitants, but by 1910 grew to a city of 124,000. This is a 62-fold increase in 47 years, or a 100 per cent addition to the 1863 enumeration every eight months.

Nebraska in 1910 had a population as great as that of the republic of Ecuador, and the legislature of Nebraska therefore appears to be as important a body as the congress of that republic; the wealth of the state is almost $2,500,000,000. The area of 80,000 square miles is almost equal to the combined areas of New Foundland, Nova Scotia and New Brunswick. Nebraska's 6,000 miles of Rail Road would give a double track from Lincoln, Nebraska, to New York City, and thence a single track to the City of Mexico.



DENVER, 1870. WHAT A DIFFERENCE NOW.

BIRD'S-EYE VIEWS OF DENVER AND COLORADO SPRINGS, 1910.

Colorado.

At the dawn of the real new world in 1830, few white men had ever penetrated west as far as Colorado. When thinking of the Colorado discovered by Zebulon Pike, and the westbound conestoga bearing the legend, "Pike's Peak or Bust," it is startling to realize the transition which has taken place in the mountain state.

Rapid Change of Scenery.

In 1879, three years after Colorado's admission to the Union as a state, there were less than 200 miles of local Ironed Way in the Commonwealth.

At that time, but 30 years ago, the Rio Grande Rail Way system began to build in Colorado; to-day the barren waste and wilderness of a few years ago is gridironed by 30 main lines and branches of a single Rail Way system.

A Twenty-fold Increase.

The population has increased from 39,000 in 1870 to 799,000, the state advancing in rank from 41st to 33rd.

Not only have fortunes been made in the gold, silver and lead mining industries, but to-day Colorado's great steel mills, blast furnaces, coal mines and coke ovens vie with the iron industry of the East, producing almost as much in value of base metal as from precious ores.

How Riches Have Come.

Manufacturing shows a marvelous increase; from an output of a few hundred thousands the manufactures of the state have grown in value to more than $100,000,000 a year. The value of the 1906 gold output was $23,000,000 and of silver $8,500,000. The pig iron production for the year 1897 was 6,000 tons; to-day it is 6,000 tons a week. In 1880 the coal output was 400,000 tons; and now it is 1,000,000 tons a month, or 12,000,000 a year.

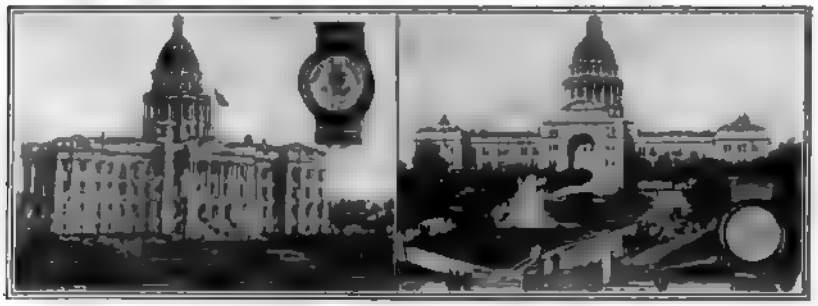
Thirty years ago, when Rail Roads began to be built, Denver was an outlying trading post of 19,000 population. To-day there are 213,000 inhabitants, and it is one of the great oases in what was once the vast American desert, between St. Louis and San Francisco. The state has a wealth of $1,500,000,000.

The Developer.

What could this geographically isolated state have done or become were it not for the assistance of modern transportation? The Railed Road mileage has increased from the scattered pioneer systems of 1871 to a total of 6,100 miles to-day, enough to span the distance from Denver to Yokohama, Japan.

The Centennial State's area of 104,000 square miles practically equals that of the empire of Hungary, which supports a population 25 times as great as that of Colorado.

Porto Rico, with her centuries of history under the white man's dominion, has a population only slightly in excess of that of this new state.



CAPITOL, COLORADO

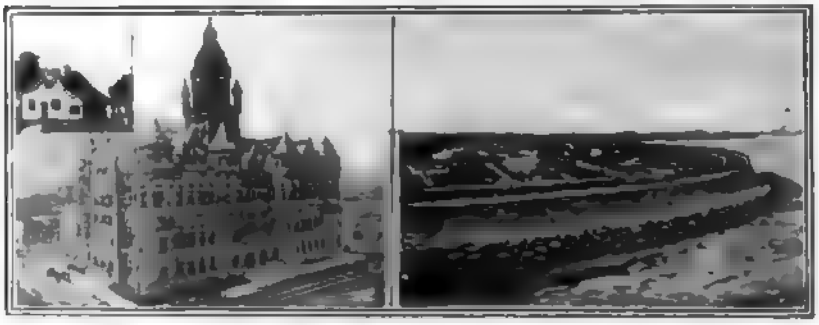
CAPITOL, TEXAS

Texas.

Lone Star State.

Texas, popularly known as the "Lone Star State," strikingly illustrates the progress of empire in America. It originally belonged to Spain, and later was a part of Mexico.

The American population increased very rapidly, so that in 1836 Texas, under the leadership of Sam Houston, that extraordinary soldier of fortune, who was in turn governor of Tennessee, chief of an Indian tribe, later governor of and United States Senator from Texas, and a candidate for President of the United States, took up arms against Mexico. An independent government was established, and the republic of Texas was as free as the United States, with her own president and cabinet, including a secretary of the navy, although there was no navy.



TEXAS STATE CAPITOL COMPARED WITH TRESNO COUNTY COURT HOUSE, TEXAS

THE FAMOUS SEA WALL, GALVESTON, TEXAS.

Rapid Progress

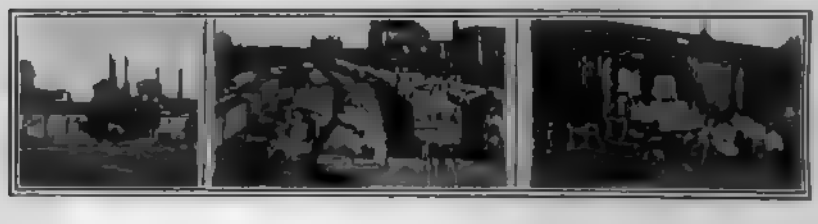
December 29, 1845, Texas was annexed to the United States and immediately admitted as a state. This led to the war with Mexico.

In 1851 Rail Road building commenced in the state, which only then really began its remarkable march of progress.

Texas had issued a number of charters for Rail Roads, some as early as 1836, but as late as 1854 there were only 32 miles of Rail Road in operation throughout the state. To-day there is a total mileage of over 13,000.

Making Money.

The number of manufacturing establishments in 1850 was 309; in 1905, the year of the latest government statistics, there were 13,000, a more than 40-fold increase. Ohio and Illinois had 13,700 and 14,000, respectively. The capital invested in the earlier period was $539,000; to-day it is $200,000,000, a 37,000 per cent increase. The wages paid in the first year mentioned were $322,000; in 1905, $25,000,000, or $75 for one.



SOUTHERN INDUSTRIES: SUGAR MILL, TRAINLOADS OF COTTON, LOADING STRAWBERRIES.

The value of the output in 1905 was more than $150,000,000. It is estimated that in the last five years there has been an increase over these figures of at least 50 per cent.

The Millions Brought In.

During the period of Rail Road development the population of Texas grew from 200,000 to 3,896,000. In 1850, in population, Texas ranked as the 25th of states and territories, and to-day it is the fifth.

A Nation in Area.

The average person scarcely appreciates the area of Texas. A man standing at Texarkana, in the east of the state, is nearer to West Virginia and North Carolina than to El Paso, in the other end of the state. The two most widely separated towns of the state are farther apart than New York City and New Orleans, La.

The northern border of Texas is nearer to Canada than to its own southern border. If a map be taken and folded to the right, the state will extend into the Atlantic Ocean far east of Florida and Georgia; if folded to the left, a part of Texas will be immersed in the Pacific.

Production.

Texas has 10,000,000 cattle and live stock valued at $300,000,000. The state raises 4,000,000 bales of cotton, worth $225,000,000, or more than the cotton produced by any country aside from the United States, and 70 times her own crop of 1860. The state raises also 15,000,000 bushels of

wheat, enough to make 3,750,000 barrels of flour; 400,000,000 pounds of rice, 10 pounds for each inhabitant of Japan or about one for each Chinaman, are also raised. The total annual value of all farm products of the state is placed at $400,000,000.

In 60 years.

The total value of this great area as late as 60 years ago was about $40,000,000, while to-day it is fully $3,000,000,000, every dollar of property value in the state having been multiplied, on the average, 73 times in 60 years, 120 per cent of the original having been added annually.

Houston, in 1860, had a population of 4,800, against 78,800 in 1910, 1,500 per cent higher in 50 years. Dallas has increased more than nine times her 10,000 population in 1830.

Fort Worth, with 6,000 inhabitants 28 years ago, to-day has 73,000. El Paso makes a wonderful showing, for where formerly lived some 700 pioneers are now 39,000 people.

Equaling France.

Texas, with 260,000 square miles, is as large as France, with territory for a state as large as New York left over. Or, again, it is as large as the empire of Austria and Hungary. Its population is practically equal to that of the United States of Colombia.

Not until 1882 did improved carriage reach the western part of Texas, and its marvelous development has dated from then. Texas, an outlying territory, has in truth become one of the greatest of our states. As it is practically without navigable rivers, improved land transportation is the prime influence which has created the new Texas.

GIANT CACTI, NEW MEXICO.

A SMALL IRRIGATED FIELD.

New Mexico.

Unlimited Possibilities.

New Mexico equals Austria in area, which supports 29,000,000 persons, ninety times the population of New Mexico. New Mexico's Rail Way mileage of 3,000 is double that of Portugal.

New Mexico was formed from territory wrested from Mexico in 1846 and ceded to this country in 1848. The Spaniard, Alvaro Nunez visited it before 1537, Marcode Nizo in 1539 and Coronado in 1540.

First Years. Santa Fe was one of the earliest settlem what is now the United States, and was about 1583. By 1630, 50 missions were s through New Mexico and Arizona. In 1680 the Indians r drove out the Spaniards, who returned in 1698.

New Mexico was placed under territorial government and from 1875, when the Railed Road began to develop the its admission to the Union was urged, but without succe 1911.

From Earth's Bowels. Its annual copper output has grown from pounds in 1894 to 15,000,000 in 1909. T deposits began to be worked as soon as tr tation was available. In 1890, 25,000 ton produced; the output is now about 50,000 tons a week, or 2 tons a year.

New Mexico has 4,000,000 sheep, valued at over $13,(In 1880, when the Rail Road mileage was 758, the state h 630,000 acres of farms. The total farm acreage to-day is 6,000,000. In the same period the value of farm property creased from $15,000,000 to $65,000,000.

THE NORTHWESTERN GROUP.

The Northwestern group of states has an area of 612,000 miles It is a group of agricultural states, and is served by miles of Steam Roads; more than has Germany, with her 69, souls.

In a Single Lifetime. In the year in which the Baltimore & Oh opened to traffic, not a single state of this appeared upon the map or in the census of the United States Government. In 184 first came upon the stage of our census reports, with but population By 1850 Minnesota had joined her, the two boasting a combined enumeration of only 200,000. This wa tically the then population of the entire region covered group. To-day the population is 30 times that total.

An Iowa farm

STATE CAPITOL, IOWA. CAPITOL, MINNESOTA

Iowa.

Iowa, a wilderness when many who are living to-day were in early manhood or womanhood, ranks first in agriculture, 15th in population and 17th in manufacture. In 1830, the day of the beginning of the Rail Way elsewhere, Iowa, as such, did not exist. It was still a part of the Louisiana Purchase of 1803.

A Handful of People. The census of 1840 credited a vast region, including the greater part of Minnesota, Iowa and both the Dakotas, with 43,000 population. In 1854 it was placed under the jurisdiction of the then territory of Michigan. This region for a time was popularly called "Mesopotamia."

In 1846, 10 years before the Rail Roads crossed the Mississippi, Iowa became a state with its present boundaries. The first white settlement had been made in 1788 by Julien Dubuque, who built a fort where now stands the city bearing his name.

Des Moines a Village. Des Moines in 1850 had a population of less than 1,000, which population increased 28 times in the next 30 years. The enumeration to-day is 86 times that of 1850. Des Moines is but a part of a whole state which gained population and wealth after the introduction of the new force. In 1860, when the state had 665 miles of Rail Road, the census showed an enumeration of 676,000 people. By 1880 Iowa had 5,400 miles of Railed Road and 1,600,000 inhabitants.

The state to-day has a population of 2,224,000 and 10,000 miles of Rail Road, which would build a line reaching from New York City to Bombay, India, on the other side of the world, by way of London.

Iowa has the advantage of the Mississippi river, but no state is more dependent upon the iron highway and its whirring wheels than Iowa, probably not one per cent of whose business is handled on the Mississippi river.

A Transcontinental Train. The corn crop of the state amounts to 400,000,000 bushels, to transport which across the continent would require 22,000 trains, which would be so long that when the engine of the first is forging its way through the environs of San Francisco the last would just be rat-

tling the rails at Augusta, Maine. The market price of the yield in 1906 was $120,000,000, and at the prices of the winter of 1908 would have been $298,400,000.

More Iowans Than Danes. Thus in little more than a generation we have grown in our midst an empire with a population as great as that ruled by the king and 180 members of the Rigsdag of Denmark.

Iowa's enormous wealth amounts to no less than $4,000,000,000, and is probably twice as much as the entire wealth which the 22 cantons or states of the Swiss Republic, in thousands of years of existence and centuries of independence, have gathered together.

First Capitol, Minnesota, 1853.

St. Paul 1910

Minnesota.

A State in Nine Weeks. In 60 years, or since 1850, Minnesota's population has grown from 6,000 to 2,075,000 people, multiplying the mid-century population 346 times, at the rate of once every nine weeks.

At the beginning of modern and improved carriage in the United States, Minnesota was not upon our maps.

In 1680 Hennepin and La Salle penetrated into the region; others followed for the purpose of trading with the Indians, but no settlements were made. Zebulon M. Pike following in 1811, with others, established Fort Snelling, and the United States assumed control.

In 1862 Minnesota secured her first Rail Road. By 1870, 100 miles had been built, and meanwhile the population had grown from 150,000 to 450,000.

Transition. By 1880 the state had given 20,000,000 acres of land to settlers, and had increased its Rail Road mileage to 3,000. The population was 800,000. To-day there are 9,000 miles of road. The growth of the state has marched hand in hand with the growth of her mechanical road mileage.

The Granary of the World.

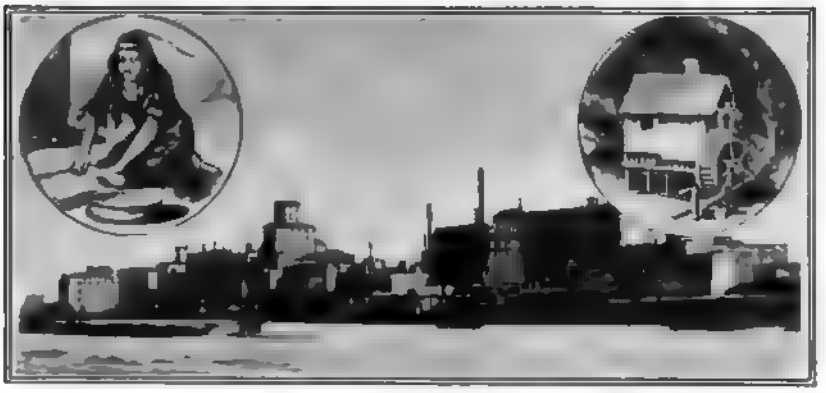
The state has become one of the greatest granaries and flour producers of the world. The 30,000,000 bushels of wheat production of 1880 has increased to 75,000,000, with 40,000,000 bushels of other grain, the total value of farm products being about $250,000,000 a year.

In a single recent year the Rail Roads hauled 100,000 cars of flour and other products out of Minneapolis, more than enough to make a solid train covering the air-line between Chicago and New York.

The lumber industry has almost quadrupled since 1880; manufactures have doubled, the annual output being valued at $350,000,000.

Where She Stands.

The area of Minnesota, 85,000 square miles, is equal to the combined area of Portugal and Roumania; the population of the state equals that of Venezuela, and the chief executive of Minnesota, therefore, has more political constituents than had Castro, her deposed president, upon whom the world's gaze was focused for so many years.



FORMER ERAS IN FLOUR-MAKING, COMPARED WITH THE MILLING DISTRICT OF MINNEAPOLIS.

Her wealth of $4,000,000,000, if converted into currency, would pay off all the national loans of Russia, the most heavily indebted country in the world.

The Twin Cities.

The twin cities of St. Paul and Minneapolis have an aggregate population of 515,000, and each is developing rapidly. Their growth in the last decade has been at the rate of four per cent per annum, which would mean 1,000,000 by 1930. They constitute the twin gridiron gateway to the great Northwest.

North Dakota.

If converted into cash the increase alone of the wealth of North Dakota in the eight years between 1900 and 1908, as officially esti-

mated, would pay the national debt of the Argentine Republic. In size it equals Guatemala and Porto Rico combined.

A Century and a Quarter Ago.

Explorations in this district were made by French-Canadians in 1780, and later it was also traversed by our own explorers, Lewis and Clarke.

North Dakota was originally owned by France, and was a part of the Louisiana Purchase. Before the settlement of the boundary between the United States and Canada, it was nominally under British rule. In 1812 Lord Selkirk, believing the country to be English territory, made a settlement at Pembina, on the Red River, but the first permanent settlement of whites was not until 1859, half a century ago.

Varied Affiliations.

At one time North Dakota was a part of Missouri territory, then of Minnesota territory, and on March 2, 1861, Dakota territory was organized, embracing what is now North and South Dakota, Montana and Wyoming.

In 1870 the population of what is now South and North Dakota was 14,000, and there were only 65 miles of Rail Road. In the next decade 1,200 miles of Rail Road were built, the population increased nine times, or to 140,000, and wheat had become a valuable crop, 10,000,000 bushels being the annual production. Farm property was valued at $15,000,000.

A Wonder of Growth.

Then followed the separation into North and South Dakota, and from that time on their history is dual In 1890 the Railed Roads of North Dakota had increased in mileage to 2,160, the population to 190,000 and the wheat production to 40,000,000 bushels. The value of farm property had increased seven-fold, to $100,000,000, and manufacturing had commenced, the annual value of the output being $1,000,000.

In 1900 the iron horse had 2,810 miles of his special highway to travel upon, the population had become 320,000, and the value of manufactured output had increased to $10,000,000. The value of all farm property in the state had more than tripled and was placed at $255,000,000

Rapid Gains.

In 1909 the Rail Road trackage of the state had grown to 4,200, equal to the distance from New York to Samoa, with a side line to Chicago. The population in 1910 had grown to 577,000—equal to that of Paraguay. The value of the state's manufactured output increased to $15,000,000, and the wheat crop reached 70,000,000 bushels. Flax and barley became important crops, the former reaching $14,000,000 in value, the latter $8,000,000. The value of all farm property was placed at $450,000,000.

The Developer.

The development of this great inland empire, which has no real water transportation facilities, seems to have followed closely upon the banding of the state with roads of steel.

EARLY BISMARCK.

STATE CAPITOL, BISMARCK.

South Dakota.

Although included in the Louisiana cession of 1803, South Dakota, as a part of Dakota territory, was under nominal British rule before the settlement of the boundary line between the United States and Great Britain.

It was not until 1871 that the first steamboat entered this part of the United States.

The Beginning. The construction of the real inland transportation system began in 1872, when the population of Dakota territory numbered but 14,000. In 1880 there were but 500 miles of Rail Road in South Dakota. Statehood was obtained in 1889.

To-day there are 3,850 miles, enough to build a road from Carson City, Nevada, to New York City, and thence south to Atlanta, Georgia. South Dakota at present has a population of 583,000, while its wealth is about $1,000,000,000.

From the Black Hills. The gold output of its "Black Hills" for 1908 was valued at $8,800,000. In 1890 the only manufactures were neighborhood industries with an almost nominal output. In 1908 the value of manufactured products amounted to $20,000,000.

In 10 years the bank deposits in the state leaped from $10,000,000 to $70,000,000, 90 per cent of which were individual deposits.

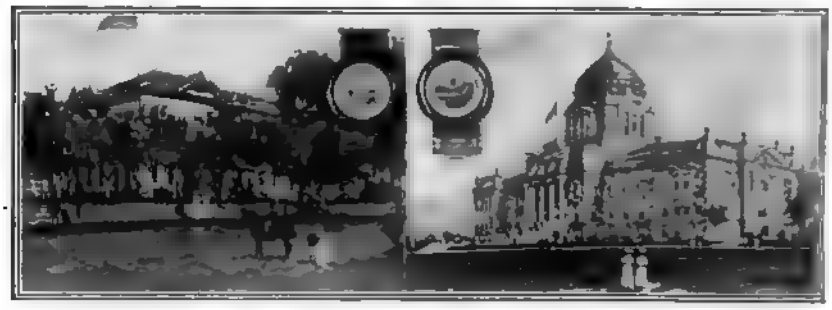
Farming the Great Industry. The number of acres in farms in the state since 1880, when the Rail Road mileage was big enough to be important, has increased 1,050 per cent, from 1,900,000 to 20,000,000 acres, and the value of farm properties has advanced 2,300 per cent, from $15,000,000 to $350,000,000, or nearly 50 per cent per annum. In the same period the annual wheat production has increased from approximately 5,000,000 bushels to 40,000,000, or 700 per cent.

Wool, Live Stock, Etc. Almost $1,000,000 worth of wool is marketed each year, and the live stock production of 1908 reached a value of $40,000,000, while all farm products were valued at $185,000,000, an increase of $70,000.000, or 60 per cent, in only four years.

The Rail Roads of South Dakota in 1908 carried to markets in other states agricultural, dairy, orchard and live stock products valued at $98,083,000.

Liquidating Our Debt.

The area of South Dakota, 77,000 square miles, is greater than that of the republic of Uruguay. The population exceeds the number of men and officers of Great Britain's standing army, subject to the orders of King George V., their commander-in-chief. The wealth of this young offspring of the Louisiana Purchase would, if converted into cash, already liquidate the national debt of the United States.



CAPITOL, SOUTH DAKOTA CAPITOL, MONTANA.

Montana.

Montana equals Japan in area; it supports 376,000 inhabitants; Japan supports 50,000,000. In population Montana equals Saxe-Weimar, the German State

Hybrid Parentage.

Montana was formed from Idaho and Dakota territories, and was embraced in the Louisiana Purchase of 1803 and in the Oregon territory.

The mines in this state were opened in 1862. A military road was opened in the same year along the line of what has since become the Northern Pacific Rail Road.

Shoulder to Shoulder.

In 1870 the population of the state was but 20,000. The Northern Pacific was completed in 1883, and in seven years the population increased from 39,000 to 132,000, the total Rail Road mileage being then 2,100. The latter has since increased to 3,650 miles, and the population has tripled.

The Yellow Metals.

Montana is our greatest copper-producing state and the smelting and refining of this metal and of lead are the chief industries, the value of the output being $20,000,000. In silver $8,000,000 is mined annually, and $4,000,000 in gold.

Agriculture and stock raising are important in the life of the state. Many thousand acres given over to grazing have lately been converted into farms, the adaptability of the land to "dry farming"

HELENA, MONTANA, 1873.

POWER DAM NEAR HELENA, MONT.

–without irrigation—having been demonstrated. Water power and irrigation now under development promise a greater future for the state.

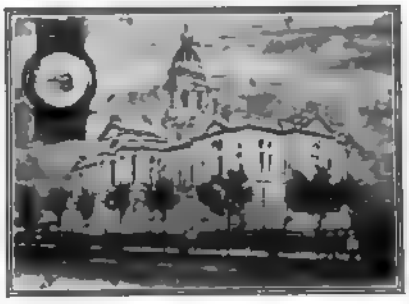
Montana's Industries.

The value of the principal crops of the state exceeds $20,000,000 annually. Wheat alone has increased from a crop of 800,000 bushels in 1893 to 4,000,000 bushels. The value of farm property in the state has increased from $12,000,000 in 1880 and $60,000,000 in 1890 to more than $150,000,000.

There are 5,000,000 sheep in the state, yielding annually $6,000,000 in wool.

HYDRAULIC GOLD MINING

WYOMING STATE CAPITOL.



Wyoming.

An Elaborate Family Tree.

Wyoming is unique among the states in having been under more rulers and more kinds of governments than any other.

It was under thirteen Spanish rulers, the list beginning with Ferdinand and Isabella and ending with Joseph Bonaparte. Ten emperors of France, the French Republic and the consulate of France also in turn controlled the destinies of Wyoming

A Part of Many States. The states of Louisiana, Missouri, Texas, Oregon, Utah, Nebraska, Washington, Dakota and Idaho, each for a time embraced part of what is now Wyoming, for the state is the only one which was formed from three of the principal annexations which constitute the territory of the trans-Mississippi.

The first white settlement was at Fort Laramie in 1854. Wyoming became a territory July 25, 1868, and a state July 10, 1890.

$2,500 Per Capita. The area of Wyoming, 97,890 square miles, is equal to that of England, Scotland, Wales and The Netherlands combined. Its wealth is equal to an average of $2,500 per capita for the 145,000 of population. Truly is this an empire in the embryo. The population is equal to the combined population of the Danish West Indies, and Iceland.

The Rail Road came to Wyoming about the time the commonwealth was admitted into a half sisterhood with the rest of the states by a territorial form of government.

The Increase. In 1870, when the population was 9,000, the Rail Road mileage was 459; by 1890 the Rail Road mileage had increased to 1,000 and the population to 60,000. To-day there are 1,600 miles of Iron Highway.

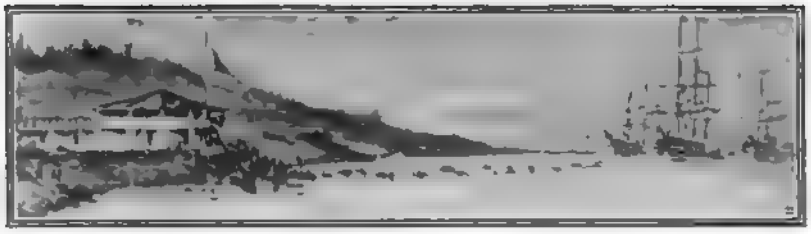
Hidden Riches. The great natural wealth of the state is only now becoming known. Almost every mineral is found in its mountains, and with the continued extension of the Rail Road, mining promises to become an important factor.

Her leading mineral industry to-day is coal mining. It had its origin with the advent of the transcontinental Rail Road, and as the Rail Roads have been extended the industry has developed. In 1907 the output was 12 times the output of 1880, or 6,218,000 tons, varying from pure lignite to high-grade, long-flamed bituminous coal. The area of workable coal lands is 20,000 square miles.

Millions of Live Stock. Wool growing is the leading industry, and the value of the clip of 1907 was $12,000,000. There are 5,000,000 head of sheep and 750,000 head of cattle, of an aggregate value of $32,000,000.

The world-famous wonderland, the Yellowstone Park, is located in Wyoming.

JULESBURG STAGE STATION, WYOMING, 1867.
A PREDECESSOR OF THE RAILWAY STATION.



RAISING THE U. S. FLAG IN CALIFORNIA BY COM SLOAT, MONTEREY, 1846.

THE PACIFIC GROUP.

Second Largest.

The Pacific group, embracing the states on the western side of the Rocky Mountain range, is the second largest in the nation, approaching within a few square miles the area of the Southwestern group.

If "Time's noblest offspring is the last," then the Pacific group may be considered the noblest of the nation's children. Forty years ago it was a region in which were a few mines and miners, being crossed only by a few faint trails and one or two fairly well-worn ones.

The Valued Servant.

To-day the 718,000 square miles of territory are cobwebbed and criss-crossed by many thousand miles of Steel Roads. The valleys and the mountains ring with the clamor and hum with the whir of industry.

The 485,000 population of 1860, three-fourths of which was in California, now has grown, outside of California, 42-fold in 50 years. The wealth to-day is already more than $8,000,000,000, or enough to pay all that the nation owes nine times.

California.

The Golden State.

California has a coast line as long as from Boston to Charleston, S. C., or about 850 miles, and an area practically equal to that of the states between those cities, excluding Pennsylvania, although the population is only seven per cent of the eastern coast section.

The governor rules over more persons than the president of Bolivia, and the commonwealth has a treasure equaling the value of the foreign commerce of the United Kingdom.

In 1536 Cortez visited Lower California, naming it "California."

Drake's Entry.

In 1579 Sir Francis Drake, Queen Elizabeth's buccaneer admiral, sailed into San Francisco Bay. He called the land "New Albion."

California was colonized in 1768 by Spanish Franciscans headed by Father Junipero Serra, San Diego being founded July 15, 1769.

In 1776, the year of American independence, San Francisco was settled.

Long Solitude. Even the crudest communication was not established with the Mississippi River and the territory lying east of it until the Santa Fe trail was opened in 1821.

The American conquest of California was achieved in 1846 when Frémont, the pathfinder, seized Sonora and declared war on Mexico. It became American territory by the treaty of peace with Mexico in 1848, but never had a territorial government. In 1850, following the gold fever of 1849, the state was admitted to the Union.

Marvelous Extension. As late as 1848 San Francisco was but a village of perhaps 1,800 inhabitants. To-day it has 416,000 people. The whole state then had only 14,000 inhabitants, or one to every 11 square miles; in 62 years this number was increased 170-fold, to 2,377,000 souls.

With 156,000 square miles, California is almost 20 per cent larger than Prussia, although its density of population is only three per cent of the latter's. The population of the state equals that of Montenegro, Panama, the Spanish Islands, Spanish Africa, Surinam, Dutch New Guinea, Waldeck and Lippe all combined.

The Central Pacific Rail Road in 1869 opened the doors to expansion.

Importance Realized. With two per cent of the country's population, the state to-day has within its limits three per cent of the Rail Road mileage—7,050 miles, enough to reach from San Francisco to New Orleans and back, and thence to New York.

That the extension of the Railed Road has made possible the wondrous increase in California's products seems to be indicated by the fact that the state's development has kept even pace with the addition of the steel rails.

Mines. The mineral output in 1908 was about $54,000,000, an increase of 18 per cent over 1906, when the output was $46,776,085, to which gold contributed $18,700,000. Twenty years ago the yearly output was less than $20,000,000, of which gold constituted 75 per cent.

The total annual receipts from the development of California's resources, including $75,000,000 from lumber, are $375,000,000. Manufacture shows an additional output of the enormous sum of $368,000,000 annually.

The orchard and vineyard products 10 years ago were worth $28,000,000; to-day they are worth above $50,000,000 annually.

Part of the Farmer's Tithe. The fruit and fruit canning industry were born when the Steam Road enabled fruit to be carried east and north California fruits valued at $2,500,000 are shipped to England annually. The canned fruits from California are valued at $15,000,000.

STATE CAPITOL, CALIFORNIA STATE CAPITOL, WASHINGTON.

Washington.

Where We Stand. When the transcontinental Rail Road in 1870 shattered the isolation of the Pacific Coast, Washington territory had a population of only about 23,000, or little less than Norristown, Pa., has to-day. In 1900 the state had a population of 520,000; to-day 1,141,000 persons reside in this great new-world empire, which already supports more inhabitants than Tripoli. The wealth of the state, $1,250,000,000, equals that of the ancient kingdom of Greece, the cradle of culture.

The Infants of the Northwest. Seattle, the "Queen City of the Northwest," and Tacoma were mere villages in 1870; even Olympia, the then principal settlement, was but a town. Ten years later Seattle had but 3,000 inhabitants, but by 1900 these had increased to 80,000. Ten years have shown a growth of 194 per cent, or to 237,000. Six of Seattle's 26 banks recently showed they had aggregate individual deposits greater than the deposits of all the banks of the state in 1900.

Tacoma. Tacoma, with 37,000 population ten years ago, records a similar marvelous growth. The population in 1910 was 83,000. This growth has occurred since the coming of the great transcontinental Rail Road systems. Those within the state extend for 3,600 miles.

Washington was a part of the Oregon territory. Seven years after the title of the United States to this region was recognized it was organized into a territory. Only 20 years ago, or in 1889, Washington was admitted as a state.

Biography. The fearless navigator, Cooke, and the daring Drake explored the waters of the North Pacific. The history of Washington is wrapped up with that of the Pacific Coast and dates back to the days of Balboa and Bering. The country was brought to the verge of war by the efforts of the early settlers to maintain communication with the mother who had sent them out over the Oregon trail. "Fifty-four-forty or fight" was a slogan in a memorable presidential campaign.

TACOMA HARBOR.

Reason for Pride. **The story of Washington is the story of empire building, the story of the opening of the Northwest and of the leveling by the Steam Road of the mountain barrier which Nature interposed.**

When we think of the comparison of this child state with the nations earlier mentioned, the citizens of this commonwealth have indeed reason for pride in the marvels that have been accomplished within its boundaries.

Oregon.

In 60 years the population of Oregon has increased 10,000 per cent. An increase of 9,000 per cent has taken place in less than 40 years—since the introduction of the iron links in 1870.

The Beginning. In 1834, 1,000 persons with 120 wagons and 5,000 animals, started from St. Louis across the continent, and established in the Northwest the first colony which was not dependent upon fur trading or hunting and trapping.

The United States claimed "Oregon territory" by virtue of discovery in 1792, and exploration by Lewis and Clarke in 1805-06.

PORTLAND AND MT. HOOD

England also laid claim to it. In 1811 the Pacific Fur Company, of which John Jacob Astor was the leading member, established "Astoria," on the Columbia River, as a trading post.

The Rightful Possessor.

In 1818 a treaty was entered into between Great Britain and the United States providing for joint occupation. This continued until 1846, when Great Britain relinquished her claim to everything south of the 49th parallel.

Building the Railed Roads.

The population of what is now Oregon was but 6,000 in 1845. A little later Asa Whitney's plan for building a Rail Road from the Mississippi to the coast was ridiculed as impossible; and Whitney, after exhausting his fortune, died broken hearted and penniless.

In 1874 Villard organized the Oregon Railway & Navigation Company. The last spike of the Northern Pacific, the great connecting link between the East and the Northwest, was driven in 1883. By 1890 there were 1,500 miles of Railed Road, and to-day there are 2,000 within Oregon's borders, enough to reach from New York to Monterey, Mexico.

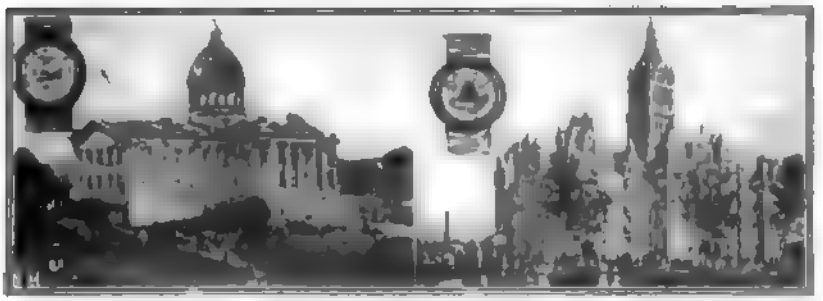
Trade.

Since the completion of the Northern Pacific the state has sprung rapidly forward in many lines of industry. Her lumber production of less than $2,000,000 in 1880 has increased 11-fold to $23,000,000. The value of her manufactured output is now placed at $75,000,000 annually, against $36,000,000 as late as 1900.

Although there were but 8,000 people in Portland in 1870, there were 90,000 by 1900, and to-day there are 207,000. The state itself has also wonderfully increased in population, the inhabitants 50 years ago numbering but 13,000; there are over 55 times as many, or 672,000 to-day.

Equal to Paraguay.

Oregonians may well felicitate themselves for having in 50 years gained a population as great as that of the republic of Paraguay, which has 630,000 inhabitants. The area of Oregon, almost 100,000 square miles, is considerably above that of England, Wales and Scotland combined.



THE CAPITOL OF OREGON THE CAPITOL OF UTAH

VIEW OF MORMON GULCH NEAR ASPEN TUNNEL.

PROMONTORY POINT UTAH.

Utah.

A Mormon Settlement. Utah was settled by the Mormons in 1847, when a little body of religious enthusiasts emigrated from Nauvoo, Ill., to the Great Salt Lake. It was organized as a territory in 1850 from a part of the land acquired from Spain after the close of the Mexican war. Its then limits, besides the present state, embraced Colorado and Wyoming and part of Nevada.

Driving the Last Spike. Utah only became important on April 28, 1869, when, at Promontory Point, 53 miles west of Ogden, the golden spike was driven joining the Central Pacific with the Union Pacific Rail Road. This junction of Railed Ways not only made Utah, but all states west of it, commercially and physically a part of the Union.

The New Life. These Railed Ways have developed the agricultural and mineral resources of the state to a vast extent. To-day $15,000,000 in gold and silver and added millions in other metals are produced, and Utah has become a great factor in the mining industry of the United States.

Where 20 years ago 10,000 tons of coal were mined, 2,000,000 tons were mined in 1908. The population in 1860 was about 11,000; in 50 years it has grown 34-fold, to 373,000. From 257 miles in 1870 the mileage of the Rail Roads in the state has increased to 2,000, greater than the long overland march of the Mormon pioneers from the Prairie State to where they stopped to found an empire.

One Hundred Millions. In 1880, 400,000 acres of land were under cultivation; to-day there are almost 5,000,000 acres of farms in the state. The 1880 valuation of $19,000,000 for all farm crops has increased to $100,000,000.

The Southern Pacific has spent $12,000,000 for reconstruction work in the last decade, and the great Lucin cut-off across the Salt Lake is one of the most marvelous engineering feats of the world. The new San Pedro line from Salt Lake has placed Southern California 24 hours nearer to Utah.

Powerful Peers. Utah has 50 per cent more territory than Java, which supports 28,000,000 people, and its wealth, $500,000,000, is as great as the total yearly exports of the continent of Australia and the Argentine Republic combined.

Arizona.

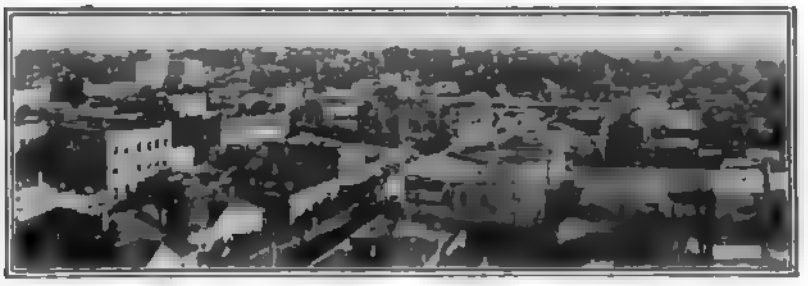
Arizona was visited by Spaniards, Nizan in 1539 and Coronado in 1540. Jesuit missions were established among the Indians at an early date. It was organized as a territory in 1863, and will probably be admitted as a state in 1911.

Present Status. The value of its copper output is about $8,000,000, and of gold and silver $5,000,000 yearly. It has an area of 112,000 square miles—a territory almost as great as the kingdom of Italy—and a population of 204,000.

Up to a decade and a half ago Arizona was considered a mining country, but the extension of irrigation has given a wonderful impetus to agriculture.

Developing Its Wealth. The farming area of 1880—135,000 acres—increased to 2,000,000 by 1900. All cereals are grown, barley being the principal crop. The total value of all farm products was $6,997,097 in 1900 and $10,000,000 in 1908. Arizona has $15,000,000 in cattle, sheep, horses and mules on her wide ranges, equal to the total annual value of the state's mineral output.

Twenty Hundred Miles. The steam horse entered Arizona in 1880. In 1890 the mileage had grown to 1,096, and to-day the state has 2,000 miles of the parallel steel ribbons, enough to connect the state capital, Phœnix, with the nation's capital. Much greater development, however, is expected when this mileage is adequately extended.



TUCSON, ARIZONA

Idaho.

Idaho was part of Oregon territory, the American title to which was perfected in 1846. When the territory of Washington was organized in 1853, Idaho was embraced within its borders.

As late as 1860 it was largely a trackless wilderness, crossed only by two of the roughest trails.

The Lust for Gold.

In that year gold was discovered. Within the next two years 30,000 persons flocked into the gold section, and when, the next year, the Boise Basin fields were discovered, 40,000 others rushed in. After producing $250,000,000, the known gold fields were for the time being exhausted, and the 70,000 "folded their tents like the Arabs and as silently stole away."

Transition.

In 1863 Idaho, then including parts of what are now Montana and Wyoming, was organized as a territory. Montana was organized in 1864 and Wyoming in 1868. When the Pacific roads were finished in 1870 the population of Idaho, according to the Federal census, was only 14,998. The territory was still little more than a wilderness, and a student of Idaho's progress and prosperity, a well-known writer, asserts that "it would have remained so but for the Rail Roads."

EARLY STAGE COACHING DAYS IN IDAHO & HELENA MONT AND TICKET FARE $145.00

The New Genesis.

The Oregon Short Line crossed Idaho in 1885, and this marked the real beginning of the state's growth. In 1890, when the territory became a sovereign state, it had a population of 80,000. It had then 940 miles of Rail Road. To-day there are 1,750 miles of Rail Road, enough to reach from New York through New Orleans and well toward Galveston, and the population has increased to 325,000.

The extension of the Railed Roads revived the abandoned mining enterprises and opened up many new districts. To-day the mineral output of the state is valued at $25,000,000 annually, including $14,000,000, the value of the lead output, $3,500,000 silver, $1,500,000 gold and the rest miscellaneous.

Enterprises Quickly Grown.

The manufacturing enterprises a few years ago could have been reckoned on the fingers of one's hands. To-day the manufactured output is valued at $23,000,000, of which one-third is credited to saw and planing mills. The annual agricultural products of the state are valued at $70,000,000 and the live stock at $8,000,000.

The area of the state, 85,000 square miles, is equal to the area of the kingdom of Korea, which supports a population of 10,000,000. The governor of Idaho rules over more persons than the president of Costa Rica, and the wealth of the state, $350,000,000, if converted into cash, would wipe out the national debt of Canada and still there would be enough to pay off the debt of Honduras.

CAPITOL, IDAHO CAPITOL, NEVADA.

Nevada.

Below the Average.

With only 1.8 miles of Rail Road to every 100 square miles, and only 38 inhabitants to the mile of Rail Road, only 13 per cent of the average ruling throughout the United States, Nevada seemingly stands out as an illustration of the absence of development where transportation is lacking.

Rhode Island, with its great wealth, it may be relevant to point out, has 2,262 inhabitants to every mile of Rail Road, 60 times Nevada's average. In population Nevada ranks 49th among the states and territories, 49th in manufacturing and 49th in agriculture.

Lacking Interest.

Nevada was a part of the Mexican concession of 1848. Before that time no settlements had been made in the state, but two or three were made by the Mormons in that year. Silver was discovered in 1859. The Comstock mines have produced minerals worth about $340,000,000.

Nevada was admitted to the Union in 1864.

Because of the great mining prospects and other possibilities of the state, a movement is on foot for the construction of Rail Roads throughout all of Nevada, and it may be expected that when these have been built the state will increase its pace in the march of progress.

OKLAHOMA CITY, WITH A GROWTH OF 540 PER CENT. BETWEEN 1900 AND 1910, IS A WONDERFUL EXAMPLE OF PROGRESS AND PROSPERITY

A MIRACLE OF MIRACLES.

Oklahoma.

We have recited in brief the marvelous stories of the older states, yet even they are surpassed by the story of Oklahoma.

The Miracle. In 1880 Oklahoma was practically without population; at least this was not sufficient to justify enumeration in the Federal census. Neither did the state have any Rail Roads. By 1890 the population was 60,000, and in 1900 had reached 790,391; in 1908 it was estimated at 1,500,000, and in 1910 it was 1,657,000. The state, it may be said, has practically no navigable waters.

The name Oklahoma is Indian, meaning "home of the red man." The white man forced the opening of the territory in 1889, only a score of years ago, and 2,000,000 acres of land, lying west and north of the center of the rich Indian Territory, never having been assigned by the government to the Indians, were settled by the whites.

The Rush of Settlers. On a single day 60,000 settlers took up most of the 2,000,000 acres of land, and established homes on the fertile prairies. For a year they lived without laws, many for a time in tents, dugouts, sodhouses and shacks. On June 6, 1890, Congress created the territory of Oklahoma. Various states afterwards added other sections, Texas giving up Grier county, the famous "No Man's Land." The extent of Oklahoma leaped 22-fold, from 2,000,000 acres in 1880 to 44,000,000 acres when admitted as a state in 1908. This area is six and one-half times that of the kingdom of Belgium, and if as densely populated as the latter would have forty-three millions of people, as she probably will have some day.

In 1880 there were no Steam Roads in Oklahoma, and in 1890

there were 167 miles, which increased by 1900 to 850 miles. To-day they extend for 6,000 miles.

The Riches Already Gained. The total live stock value of Oklahoma at the time of its admission was $91,000,000, greater than the value of the live stock of the states of Nevada, Utah and Idaho combined. Already the annual output of this new state is $100,000,000 a year in farming products, and lands a few years ago worth a maximum of a dollar an acre have been sold for from $50 to $100. The state is remarkably rich in coal, the production being 3,500,000 tons in 1907.

Oklahoma produces 25 per cent of the petroleum output of the country, and has the largest known oil fields in the world, some of the output being piped and pumped to the Atlantic Coast at New York. It is likewise the possessor of the greatest gas fields. The value of the properties yielding these resources is $125,000,000.

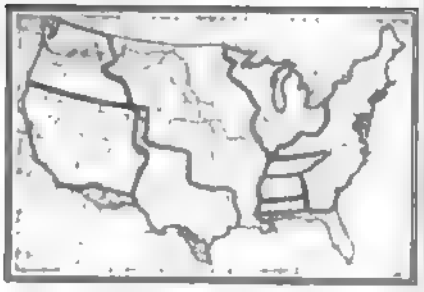
Manufacturing. The products of factories in the first year of statehood were valued at $25,000,000. On May 1, 1908, there were 803 banks doing business in Oklahoma. The capital of these banks, including surplus, was $24,900,000; their resources were $100,000,000, while the deposits were $65,000,000.

The total school fund is $33,000,000 in cash, and 27,000,000 acres of land belonging to this fund are leased for $1,000,000 a year.

A Page from a Fairy Tale. The story of Oklahoma City reads like another page from a fairy tale. Twenty years ago it was a spot upon the prairie. Now it has a population of 64,000. Oklahoma has no economic means of reaching the outside world but by the Railed Ways. Yet her property value exceeds $700,000,000. Her population, before she reached her majority, was greater than is that of ancient Wales. The size of the State is such that its territory would suffice to obliterate that of the one-time ruler of Southern Europe, European Turkey, upon the map.

The Great Medium. Someone has said that "the great state of Oklahoma has been created by the richness of its soil and the extension of its Rail Roads."

THE ACQUISITION OF THE UNITED STATES



THE TERRITORY ADDED TO THE UNITED STATES HAS VASTLY INCREASED IN VALUE.

BRIDGE ACROSS CHASM WHITE PASS AND YUKON ROUTE.

The reader may search the pages of history for a parallel to this astounding story of progress and prosperity, and determine for himself the aptness of our caption, "A Miracle of Miracles."

Dog sledge in Alaska

THE LOUISIANA AND ALASKA PURCHASES AND OUR ISLAND POSSESSIONS.

Uncle Sam as a Real Estate Operator and Speculator.

Uncle Sam is probably the most successful real estate dealer and speculator in the world. A glance at his transactions and perusal of his balance sheet substantiates this assertion.

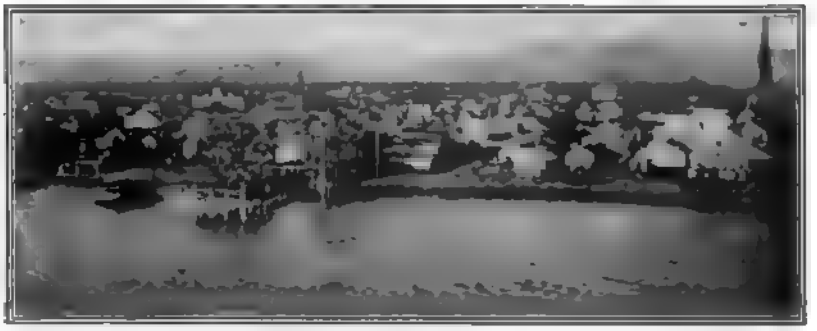
His First Venture. Uncle Sam's first venture on a large scale, and when he first branched out from his regular line of business of running the government and laid in a stock of new territory, was in 1803, when the Louisiana Purchase was effected at an outlay of $12,000,000 cash and the assumption of $3,750,000 in debts.

This proved probably the shrewdest investment ever made by any nation. The valuation of the property in the region to-day is placed at $21,500,000,000, an accumulation equivalent to paying a dividend of 100 per cent on the purchase price every 28 days since the deal was closed, to say nothing of the interest, in the form of the annual output of this territory.

His Profits on the Deal. What this purchase has meant and some of the items of annual production may be gleaned from a cursory glance at conditions to-day. For example, the yearly corn crop of Iowa alone is about 400,000,000 bushels—enough to have paid for fifteen Louisiana Purchases a century ago. North Dakota's wheat crop is 70,000,000 bushels, and that of Kansas 80,000,000 bushels; Louisiana's cotton crop has an annual valuation of $50,000,000, and the state produces besides 750,000,000 pounds of sugar and 25,000,000 gallons of molasses and syrup a year—enough to make the original cost a mere bagatelle by comparison.

54-40 or Fight. Oregon, which cost only diplomacy and a free expenditure of American pioneer energy and optimism, to-day has a valuation of $2,700,000,000—a pretty good growth since the wilderness days of 1846 and a thorough vindication of Uncle Sam as a judge of future realty values.

Texas, annexed to the United States in 1845, cost a small war



NOME, ALASKA.

with Mexico, which resulted in the further addition of California by the treaty of 1848. It led, also, to the Gadsden Purchase, which territory was added to Arizona. The territory taken in when Texas was added has to-day a valuation of almost $4,000,000,000, and the region is growing faster than ever. The California addition has a valuation exceeding $1,600,000,000.

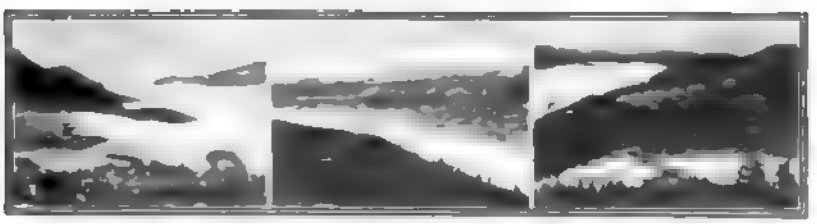
The Profit on Texas.

Texas alone—and the present State of Texas is but a part of the republic of Texas which was annexed—has a cotton crop each year valued at $225,000,000, and the value of all farm products is placed at $400,000,000 yearly. The live stock has a value of $300,000,000. Every dollar's worth of property in the territory has been added to at the rate of 120 per cent of the original per annum since the annexation.

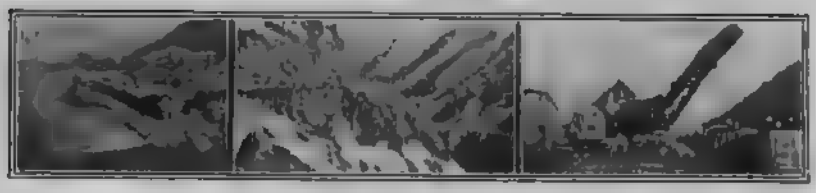
In 1867 Alaska was acquired by purchase from Russia for $7,200,000. This was another good real estate transaction, for since 1880 alone the district has produced $300,000,000 in gold, fish, fur, etc.—40 times its original cost, and her coal, gold and copper deposits and lumber are said to be fabulous in value.

Alaska's First Growth.

With the cheapening of freight transportation costs came the beginning of Alaska's development. The Wild Goose Rail Road, seven miles long, is said to have earned its total cost within 30 days after it was opened—undoubtedly a record. Passenger rates before the days of the Railed Road were 25 cents a mile, and freight tariffs were from $1 to $2 a ton per mile.



WRANGELL. WHITE HORSE. CORDOVA, ALASKA.



ALONG LAKE BENNETT WHITE PASS & YUKON RY

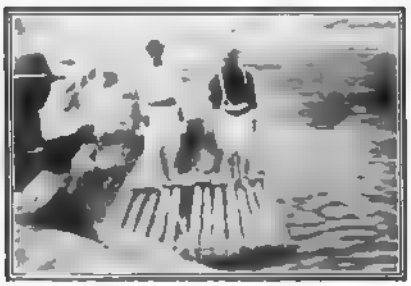
Greatest per Capita Trade.

Alaska's trade with the United States in 1908 was $46,000,000—greater per capita than that of any country on earth. Its area of 590,000 square miles is one-fifth the extent of the United States. It extends as far west of Skagway as Skagway is west of New York. Its coast line is as long as that of the United States.

It is yet too early to consider the value of the more recent acquisitions—Porto Rico, Hawaii, Guam and the Philippines. Hawaii is a stepping-stone for trade with South Africa and Australasia. Porto Rico will be a valuable stopping place when we take our place in trade with South America.

A Hong Kong for America.

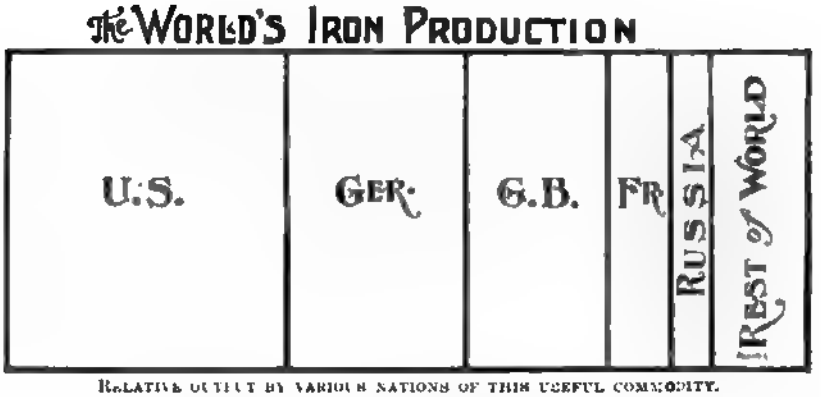
The Philippines will be to the United States what Hong Kong has been to England, a port of her own and commercial center, in enabling her to secure and hold a substantial part of the trade of the Eastern millions. Warehouses will rise on her water-fronts at the gates of the Orient, and American ships will unload their cargoes of American manufactures and American products on American soil, awaiting the call from and supplying the needs of the 800,000,000 of the Far East—more than half the world's inhabitants.



SOUNDING FOR BRIDGE, PHILIPPINES.

THE UNITED STATES VS. THE GREAT NATIONS OF THE EARTH.

We have used many of the nations of the earth as the standard whereby to measure the importance of our individual states.



Relative output by various nations of this useful commodity.

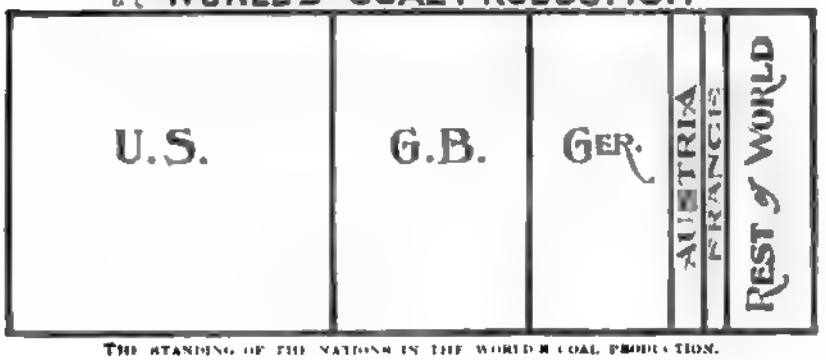
It will be interesting to complete the comparisons by showing how even the major world powers are equaled or dwarfed by combinations of a few American commonwealths.

Year vs. Centuries. The annual wealth production of the United States almost equals the total wealth, under their last census reports, of the rich republic of France or the empire of Germany. In other words, we produce in a twelvemonth the equivalent in wealth of the aggregate of centuries of either of these nations.

In seven years the United States is able to produce sufficient to duplicate the wealth of the 11 most important countries of Europe.

The states of the Mississippi Valley have an aggregate area of 1,900,000 square miles, equal to all of Europe, with the exception of Russia, yet with a slice of Russia equal in size to one and a half times the area of France.

In a Century. The growth of the Mississippi Valley's population in the past century alone exceeds the entire population of Great Britain and Ireland by 25 per cent. The 151,000 miles of Rail Road is almost equal to the combined systems of Great Britain, France, Germany, Austria-Hungary, Italy, Belgium, the Argentine Republic and the continent of Australia, while the valley's wealth is 25 per cent of that of all Europe.



The standing of the nations in the world's coal production.

A MODERN HARVESTER AND THRESHER COMBINED.

Compared With France. We find that it takes only eight of the states of the Union to equal France in population. Four of our states equal her in wealth. Nine states combined equal the British Isles in population, whereas six are sufficient to surpass England.

Paralleling the World. We have found that individual states equal, either in wealth, population, size or arable land, the empires of Japan, Turkey, Austria-Hungary, Germany, the kingdoms of Denmark, Bavaria, Wuertemberg, Italy, Scotland, Belgium, Spain, Greece, Roumania, England, Holland, Korea, Norway, Sweden and Bulgaria, the republics of Switzerland, Bolivia, Paraguay, Honduras, Nicaragua, Costa Rica, Venezuela, France, Ecuador, Panama, Portugal, Cuba and the Dominican Republic, the principalities of Hesse, Wales, Alsace-Lorraine, Montenegro, Lippe, Mecklenburg-Strelitz, Saxe-Meiningen, Saxe Weimar, Anhalt, Oldenburg and Waldeck, the dependencies of New Zealand, Tasmania, Queensland, Hong Kong, Porto Rico, Canada, Newfoundland, Nova Scotia, New Brunswick, Danish West Indies, Greenland, Iceland, Java, the Spanish Islands, Spanish Africa, Surinam, Dutch New Guinea, British Guinea, Madagascar, Tripoli, Transvaal, Orange Free State, and the continent of Australia.

Other Measures. It takes only four states to equal Austria and three to equal Hungary in population. It takes but three of our 48 states to equal the great Russian empire in wealth, and four of them combined equal Germany in this respect.

The United States of Brazil is larger in area than continental United States, yet New York, Indiana and Pennsylvania almost equal her in population, while Pennsylvania and Ohio more than equal Egypt.

Prophecies of Great Men Unfulfilled.

Even so profound a scholar as Jefferson, so great a statesman as Webster, and so distinguished a publicist as Greeley, failed to realize what the future had in store, and how the to-morrow of

each of them again would be surpassed by the to-morrow of their children.

Master, Thou Errest.

Thomas Jefferson gave it as his opinion and belief that what was in his day the United States could never be extended to stretch from ocean to ocean. He believed there would have to be four different countries, one east of the Alleghenies, another in the Mississippi Valley, a third between the Rockies and the Sierra Nevadas, and the fourth on the Pacific coast, and that these must be finally and forever separated, each from the other, as the mountains and the impossibility of practical transportation presented an impassable barrier to commerce and political union.

Webster, in a day which already saw the extension of the country to include states carved out of the Louisiana Purchase, said that what is now the state of Washington "could never come into the Union, because its senators would not reach the capital of the country before their terms had expired." While this was not meant absolutely seriously, it shows what were the ideas of that day.

Greeley's Pessimism.

Horace Greeley, optimist, and author of the famous phrase, "Go west, young man," considered the union of Oregon to civilization and the rest of the nation impossible, for in the New York Tribune he declared emigration to that portion of our nation "an aspect of insanity." Yet to-day New Yorkers eat Oregon apples and fresh Columbia river salmon a few days after they are shipped from the Pacific coast.

And we no more appreciate the greatness of our to-morrow than did those of the greatest foresight fifty years ago anticipate our greatness of to-day.

Truly, may it not be said, in the words of the first telegram, "What Hath God Wrought."

WE HELP FEED THE WORLD

PROGRESS AND PROSPERITY OF THE SOUTHERN PART OF THE NEW WORLD. FROM PAN-AMERICAN UNION.

SECTION XXXIX.

THE NEW WORLD'S FUTURE PROGRESS AND PROSPERITY. THE PAN-AMERICAN OR INTER-CONTINENTAL RAIL ROAD.

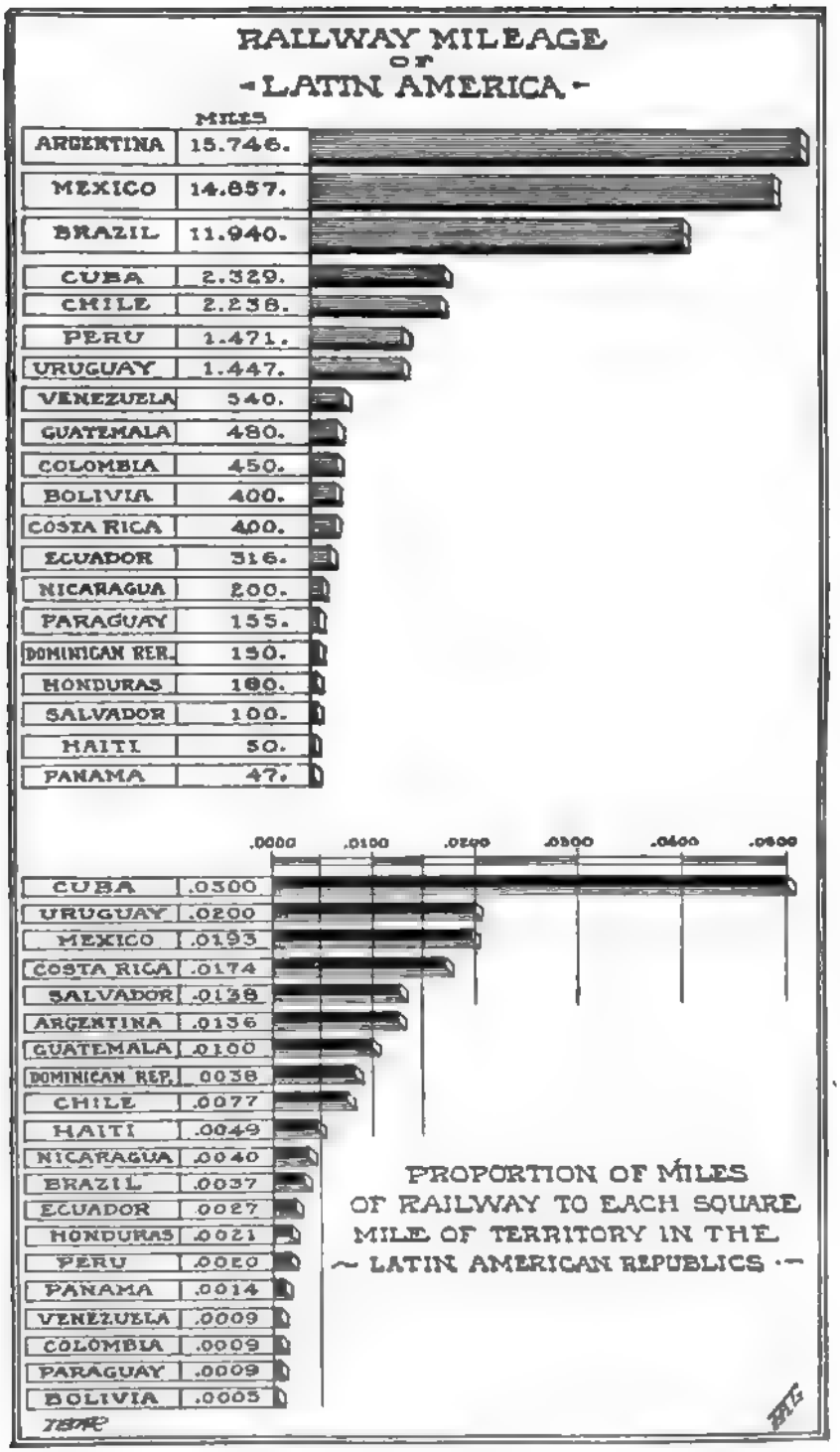
The Needed Artery and Spinal Marrow of the Western World.

In Embryo. The Western Hemisphere, from the viewpoint of commerce and industry, is hardly beyond the embryonic stage. It is but a baby, only 400 years old.

Although this Western half of the world composes more than one-third of the earth's land surface, its population is only little more than one in ten of the world's 1,583,000,000 souls. But it is safe to say that the Americas have unborn and undeveloped possibilities and resources that will bring them to a position where they will far exceed in wealth, commerce and industry the other sections of the world.

Neighbors. Linked together by land and with the same vertebrae or backbone of mountains running through both continents, their geographical, commercial, economic and social conditions and interests invite closer union.

Self-protection and commerce constitute a mutual interest of the three Americas, which would seem to point to the necessity for absolute harmony, which can only be gained by physical touch.

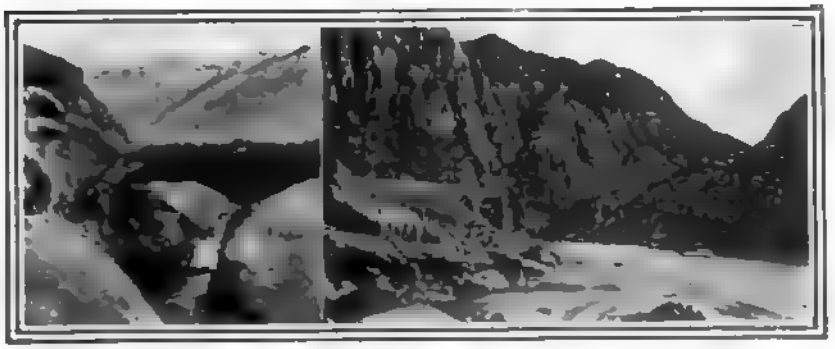


LATIN-AMERICAN RAILWAY MILEAGE.

Who Are Americans? Proud as we are of being Americans, we should be sufficiently broad minded to remember that citizens of the United States have no copyright on that term, but that it is applied and belongs to every person living in any one of the countries composing the great American Trinity.

In fact, in the press of Spain, Portugal and Italy, when the word "American" is used, it almost always refers to a South or Central American, a native of the United States, Canada or Mexico being referred to as a "North American."

Blood Brethren. We should not forget that Florida, Louisiana, the Pacific Coast, Texas, Arizona, and New Mexico were first settled by the Latin races. Nor should we forget that the difference between the people of South America and ourselves is more apparent than real, and is shown in language more than in any other direction.



THE INCAS BRIDGE OF NATURAL CEMENT. ON THE BUENOS AIRES AND PACIFIC RY.

No ties to-day are as firm as the bonds of mutual interest that are formed by the steel bands of the modern Rail Road. This is another reason why North, Central and South America would seem to have the closest community of interests, for in no section of the world have these means of communication been so wonderfully developed as in the Americas. With only one-third of the earth's land surface, and one-tenth of its population, this great triumvirate has more than half—51 per cent or 304,000 of the 595,000 miles of the world's Rail Roads. Of this, 268,000 miles are in the United States, Canada and Mexico, while Central and South America and the West Indies have 36,000 miles.

Results of Unification. We have thus the greatest and one of the greatest Rail Road systems in the world lying near each other, lacking but a mere handclasp of steel here and there to enable a unification that will make possible constant and speedy touch between our different peoples.

If the proportion of Rail Roads to population existing in the United States were maintained throughout America, South America's 32,000 miles would be increased to 145,000 miles, and all

Rio de Janeiro

Latin America's 50,000 miles would swell to 182,000 miles. Or, if the proportion of our Rail Roads to area were maintained, Latin America would have 500,000 miles, of which 425,000 miles would be in South America.

5,000 Miles Needed.

A Rail Road here and there, totaling less than 4,800 miles of road, will unite and weld the disconnected links in this great international chain. The cost is a mere bagatelle compared with the vast interests involved. Nor should any reasonable sum stand in the way when the future peace and autonomy of ourselves and our neighbors are considered.

A Navy Not Needed.

There have been but two empires of European origin in the three Americas—Brazil and Mexico. No European power which might try an experiment similar to that of France when she made Maximilian emperor of Mexico, could succeed. The fact that we now have rail communication with Mexico, insures her against invasion or territorial loss, without aid from our navy or the need of maintaining one of any size of her own. Our neighbors further south would also enjoy this advantage were they linked with us.

The cost of a dozen Dreadnoughts, which in 10 years probably would become obsolete, but which would require $75,000,000 more to maintain meantime, would supply the missing links, and would render further Dreadnoughts less necessary. Ships become antiquated -Rail Roads can easily be improved from year to year. Ships are subject to attack and destruction—such a Rail Road would be immune in any except extreme cases.

An Upbuilder, Not a Burden.

Moreover, in building this great factor for peace, instead of creating a burden, we would have a self-sustaining upbuilder, the benefit of which would be shared by twenty nations and countries.

We might guarantee the bonds as we do those of the Philippines and as we did those of the Pacific Rail Roads. The interest on the cost of this great construction would be but a matter of say

$7,000,000 a year, of which $4,000,000 might well be guaranteed by the United States, and the remainder by the other nations. In this connection, Mr. Andrew Carnegie said:

Says Carnegie: "It would be a wise use of our credit. It would save hundreds of millions of dollars which annually we spend upon a navy for the maintenance of the Monroe Doctrine."

The total cost of this great enterprise would be less than the money risked by Canada in guaranteeing the bonds of the Canadian Pacific, which quickly became profitable. Even the guarantee of the interest would cost nothing, if, as there is every reason to expect, this road becomes self-supporting at an early period.

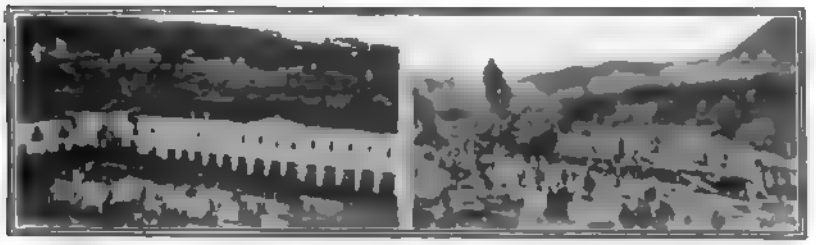
Fact Not Phrase. The United States and Brotherhood of the Americas would soon become a fact. Business men from South America would visit us and make their purchases. Our merchants would visit them and do likewise. It would be in truth "America for the Americans."

It would give us the greatest Rail Road in the world; one might travel from New York to Buenos Ayres, 10,000 miles, and it would be possible to go direct by rail almost from the Arctic to the Antarctic Circle.

A Great River System. We would be connected, not only with the thousands of miles of Rail Roads, but with the 100,000 miles of navigable rivers of South America, greater in extent than our own.

This Pan-American Rail Road means a great iron highway between the North and the South. It means progress and prosperity. We have but to remember how the wonderful resources of the United States have become known and been developed by the Rail Road, to realize that equally wonderful resources will be brought forth in South America, to benefit the nations of the Western Hemisphere and the old world.

The Near Future. It is safe to predict an impetus and a forward movement in the next decade, that will add to the prominence of our Latin brethren and give them a position among the nations of the earth thought impossible a few years ago. It will bring to them a commerce for which the United States and Europe will compete with every resource at command.



THE PLAZA, QUITO

FIRST TRAIN AT QUITO, JUNE 17, 1908.

WHEAT STACKED FOR SHIPMENT, ARGENTINA.

Our Share of the Trade—And Europe's.

The total foreign trade of the 20 Latin-American republics amounted in 1909 to $2,134,000,000 gold, of which exports were $1,245,000,000 and imports $889,000,000.

The exports of the United States in 1909 to Latin-American countries were $198,000,000 and imports $322,000,000.

Spending Money.

This means that against the United States there was a balance of trade of $124,000,000, which Latin America spent in other markets, principally those of Europe.

Among the United States exports to Latin-American countries in 1907 were: Locomotives and cars, $11,000,000; steel rails, $4,000,000; wheat flour, $13,500,000; cotton cloth, wearing apparel, etc., $7,250,000; lard, $7,000,000; oil, $14,500,000, and lumber, $15,500,000.

South America Versus Orient.

The markets of the Orient are of vast importance to the United States, but just because the East at the present moment buys more from us, is no reason why the other market should be neglected, nor can it be contended that the East will be permanently more valuable to us than our neighbors of the South.

The total value of the foreign commerce of Central and South America is far in excess of that of the far East, north of Hong Kong. As the former countries have practically only just begun their development, while that of the East has gone on for centuries, this fact may be taken as an indication of what the future promises in the way of trade for our growing sister nations.

A World's Record.

Argentina, with only 6,800,000 people, bought from and sold to other nations more in 1909 than China with 450,000,000 or Japan with 50,000,000, the total being $675,000,000. This is nearly $100 per capita, or proportionately greater than any other important country on earth. Our share was less than 10 per cent—$56,000,000.

Brazil sold to the United States in 1908, coffee and other products worth $108,000,000, but bought in return only 20 per cent of this, spending a large portion of the balance in her favor in Europe.

Chile engaged in 1909 in a foreign commerce amounting to $204,000,000, but the allotment of the United States was less than $30,000,000.

Lack of Communication by Rail and Water.

Lack of Facilities.

In studying the causes that have acted as deterrents to Pan-American accord, we find the lack of touch by means of first-class passenger and mail steamship service, to be a primary one.

There is not one first-class mail and passenger steamer flying the American flag, running to such important points as Rio Janeiro and Buenos Aires. In fact, we have but four under our flag in the South American trade, all of which are running to Venezuela.

Delegates from the United States to the Pan-American conference in Rio Janeiro went via Europe, where six different lines provide a score of modern, fast ships to the principal ports of South America, which have immeasurably encouraged communication.

A Question of Time.

If the average merchant and traveler of South America could reach New York with the same comfort and speed that he can proceed to Paris, London or Berlin, there would be at once a radical, vast and favorable change in the route of travel. But he is not going to North America in a slow boat, for he is as progressive as we are, and time is as precious to him as to us.

As it is, extreme South America, as a result of slow steamer service and lack of rail transportation, in point of time is farther away from us than almost any other point on the globe. Not long ago the Uruguayan consul at New York, when asked for some information, said he did not have it. "But," he said, "I can write to Uruguay for it; although," he added, "it will take two or two and a half months to get an answer, even if the reply is mailed so as to catch the same steamer that brought the letter."

A Pertinent Question.

The most important steamship facilities are for freight and they do not meet modern passenger requirements. What a good passenger service means may be realized when we try to answer the query: How long would Chicago maintain her prestige if she had

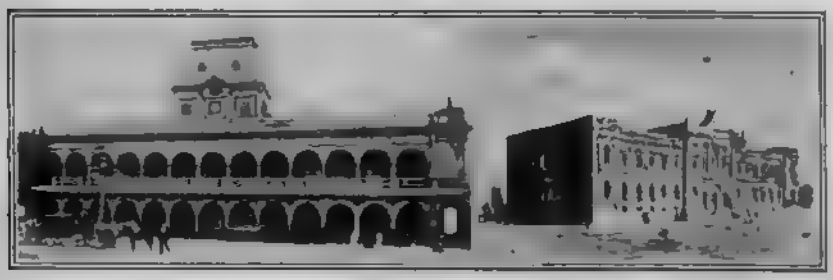
Old Spanish Bridge, Chile. National Library, Santiago, Chile

only freight trains entering and leaving the city and if passenger traffic were handled in the cabooses and on the schedules of freight trains?

Fast mail, express and up-to-date passenger Rail Road service are necessary preludes as well as accompaniments to modern progress and prosperity.

The Land of To-morrow.

Europe has been gazing toward "the land of to-morrow" longer than the United States. Even Japan, China, South Africa and Australia are preparing to grasp the opportunity here presented to extend their commerce and trade.



MUNICIPAL BUILDING, LIMA NATIONAL SCHOOL OF SCIENCE, URUGUAY

Proof of Japan's exertions to get into close touch with the West Coast of South America is found in the projection of a steamship line which is to run from Japan to Chile and by the arrangement of postal money order exchange between the two countries.

More space is devoted to South America by the press of Europe in one week than by all the papers in the United States in many months.

Europe Knows.

A short time ago a reliable financial paper in Europe made the significant statement that during the next 10 years $2,000,000,000 additional European capital will be invested in South America in various enterprises, and that Europe is seriously beginning to believe that capital is safer in South America than in the United States.

In fact, the situation has become so serious that the United States government has appointed a commission, with Dr. Arthur T. Hadley, president of Yale University, as president, one of its purposes being the studying of European views of American securities and to determine what changes of legislation are necessary in order to restore European confidence in American Rail Road and industrial issues.

The United States Department of Commerce and Labor reports that English capitalists had invested the staggering total of $3,290,023,300 in South America by October, 1909.

Some Interesting Considerations.

A Few Acres. The South American countries have unlimited resources, and they are already showing their energy and enterprise in developing them. Their possibilities are better understood when we realize that Brazil could completely cover the United States proper and still have room for another New England, New York, Pennsylvania and Virginia combined; that four Nebraskas could be put into Chile; that Texas could be lost twice in Venezuela, and still leave room for Kentucky and Tennessee; that out of the Amazon river flows each day three times the volume of water which flows from the Mississippi, and out of the Parana twice that of North America's queen of waters.

The average North American may not realize that a perpendicular line drawn south of the Statue of Liberty in New York harbor would find nearly all of South America to the east of it. South America ought really to be called "Southeastern America."

Knowledge Lacking. Few of us seem to know that Latin American history during the last four centuries is replete with incident and event, names and results that compare creditably with those of the United States and with Europe and Asia.

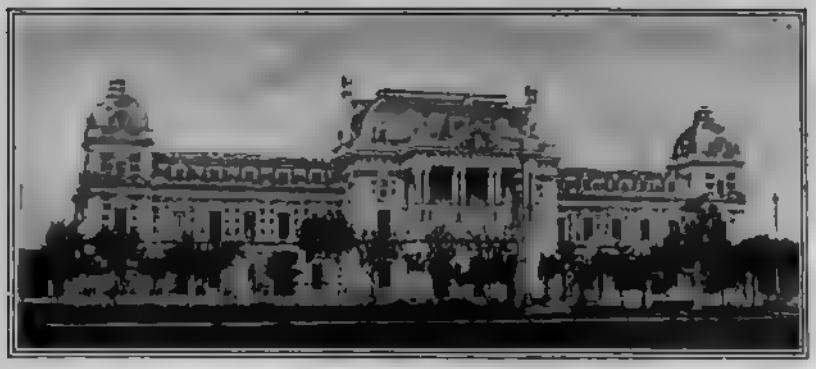
UNIVERSITY OF CHILE, SANTIAGO NORMAL SCHOOL, SAO PAULO BRAZIL

Few know the names of the great heroes, aside from Simon Bolivar, or of the statesmen, writers and scholars, who have figured prominently in evolving the Latin America of to-day.

In the World of Letters. Few are aware that the principal countries and capitals of the other Americas have groups of eminent scholars, scientists and philosophers, as well as universities and professional schools which are no less advanced than similar groups and institutions in the United States and Europe

At Lima, Peru, and at Cordoba, in Argentina, are universities whose foundations antedate those of Harvard and Yale.

Rio as a Spender. The North American does not stop to think, when he remembers the threadbare legends of yellow fever, that Rio Janeiro now has a population rapidly approaching a million, that it spent more money for public improvements in 1907 than any city in the United



PALACE OF THE GOVERNOR, LA PLATA, ARGENTINA. A SPLENDID STRUCTURE

States excepting New York, and is one of the greatest centers of civilization, industry, art, literature and education in the world.

Again, how many realize that Buenos Aires, the capital of Argentina, with a population of 1,250,000, is the largest city in the world south of the equator, and the second Latin city, ranked only by Paris, in all the world? How few know that it is growing faster than any great city in the United States except New York and possibly Chicago.

A Thing of Beauty.

The American may be interested to learn that in Buenos Aires is the finest and costliest structure in the world used exclusively by one newspaper, the home of "La Prensa"; the most magnificent opera house of the Western Hemisphere, costing more than $10,000,000, and erected by the government, and the most expensive system of artificial docks in all America, representing an expenditure of $50,000,000.

It is predicted that within one or two years Argentina will export more wheat than the United States; that the beef grown, killed and refrigerated in Argentina, will soon be shipped to New York, and that Northern Argentina in a few years will compete successfully with our Southern states as a great cotton growing region.

A Feat of Engineering.

The North American Rail Road man may be surprised to learn that between Chile and Argentina is being constructed one of the longest tunnels of the world. The highest points and most difficult construction that have ever been encountered in Rail Way work were overcome in Peru. Bolivia is spending more than $50,000,000 in new Rail Way work.

Railway Plans.

Plans for the construction of Rail Ways into the heart of Brazil, including one that will eventually connect Rio Janeiro with Montevideo, the capital of Uruguay, on the south, and with Asuncion, the capital of Paraguay, on the southwest, are well under way.

The navigation of the upper branches of the Amazon river is also to be improved, so that ultimately the Atlantic will be con-

nected by rail and water with Lima, on the Pacific coast, with La Paz, the capital of Bolivia, in the central Andean plateau, and also with Quito.

Mountains of Coal and Iron.

Back in the interior, which has heretofore been described as a jungle, are being found mountains of iron and coal and forests of valuable timber, which will supply a large part of the world's requirements in the future.

Without enlarging on the possibilties of Brazil for rubber and coffee, it can be said that this empire republic offers a field for the safe investment of $300,000,000 of American money.

Metropolis in the Wilderness.

Over 1,000 miles up the Amazon is the thriving city of Manaos, which is now looking forward to a population of 100,000, and prides itself on its excellent streets, business buildings, street car service, and handsome opera house.

Chiefly through the influence of the Bolivian minister in Washington, Ignacio Calderon, nearly $100,000,000 of American capital will be invested in the construction of the Bolivian Rail Ways.

Scratching the Surface.

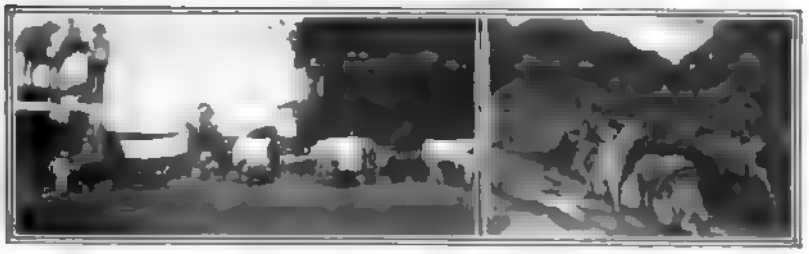
In Peru the greatest mining enterprise is in the hands of Americans, who, though they have taken out ore of stupendous value, declare that they have only scratched the surface.

Paraguay seems to be tucked away in the interior of South America so that its agricultural and timber wealth are not appreciated, but every consular report that comes from Asuncion shows that the Paraguayans are anxious to encourage the investment of North American money. For Uruguay it can be cited that the government is spending $10,000,000 in making the harbor at Montevideo one of the best in all America.

The Germans Are Active.

In Chile's material and industrial possibilities Europe evidently has confidence. This is proved by the eagerness with which German and English capital is seeking investment. The Chilean government expects to spend at least $10,000,000 in making Valparaiso a safe harbor.

Although we think of South America as possessing a large waste area due to tropical heat, this portion is not any more extensive than that of North America lying barren under lasting



THE DONKEY, OX-CART AND LLAMA—THREE CHIEF SOUTH AMERICAN MEANS OF CARRIAGE

snows or continued cold. The tropics, moreover, will support a great population, while the severely cold regions must always be thinly populated.

Altitude and Climate.

Altitude effects a very remarkable physical phenomenon in climate. For instance, if a man standing on the equator at sea level, mounts a mule and rides up into the mountains until he reaches an elevation of 5,280 feet, or one mile, he will experience as great a change of temperature and vegetation as if he traveled 1,500 miles due north; if he continues on to the plateaus of 10,560 feet altitude, or two miles, he will find a difference as great as if he journeys on the surface of the earth almost as far north as New York.

If, as statisticians certify, $1,000,000,000 of North American money has been invested in Mexico, it would certainly seem that there is profitable room for many billions in the immense territory of South America.

Room for Much More.

In Cuba, already, $250,000,000 of American money is invested. In Porto Rico, the Dominican Republic, Haiti, the Central American states and Panama, outside of the Canal, we have $60,000,000 more—and yet the development of their resources has only begun. One of the most conservative representatives of a great English banking house told the Hon. John Barrett, when the latter was United States minister in Bogota, that Columbia alone could give profitable investment during the next 10 years to $250,000,000 of foreign money.

BROAD GAUGE TRAIN ON BUENOS AIRES & PACIFIC

Some Central American Reflections.

If California were laid end for end on Central America, Salvador, which is just the size of New Jersey, would not be hidden. Stated in another way, if Central America were lifted up bodily and laid down on our Atlantic coast, it would just hide all New England, New York, Pennsylvania and New Jersey.

Respectable Sizes.

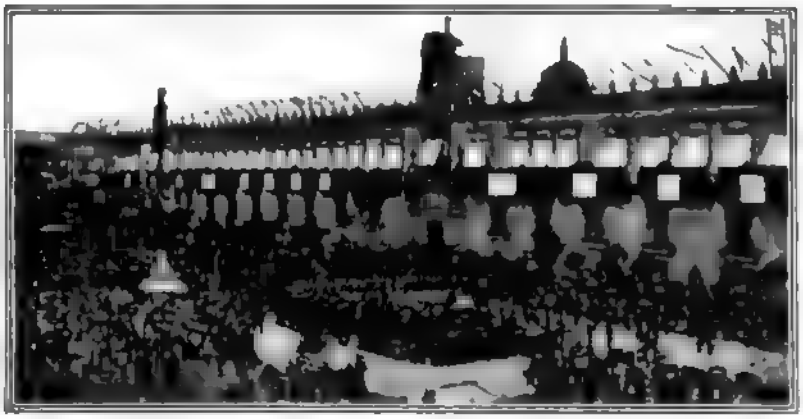
The republics could be compared as follows: Honduras with Pennsylvania, Guatemala with Mississippi, Nicaragua with New York, Costa Rica with Vermont and New Hampshire.

In a few years it should be possible to cross each Central American country, from sea to sea, by rail.

What has been done in improving sanitary conditions at Panama can be duplicated everywhere to the benefit of the health of every Central American.

Commerce. The total foreign commerce of Central America amounted to $108,000,000 in 1909. Of this, exports were $38,635,000.

No matter how many steamship lines may be put in operation between the Pacific, Gulf and Atlantic ports of the United States and Central America, the principal cities and centrally located points of that section will never be reached rapidly and by large numbers of people until the Pan-American Rail Way system is constructed from Mexico down through Guatemala, Salvador, Honduras, Nicaragua and Costa Rica, to Panama.



THE NATIONAL PALACE, CITY OF MEXICO.

A Summary.

The inter-continental or all-American Rail Way question may be briefly summarized:

A Business Reason. It has the most essential of all modern reasons, one which certainly appeals to every American, for its construction and early completion: it is a good piece of business for practically all the people in one-half of the world.

The fact should be realized that there are 100,000,000 people on the one hand and 68,000,000 people on the other, who want to, should and eventually must do business together. If the 68,000,000 ignore the trade opportunities among the 100,000,000, or the 100,000,000 let the trade of the 68,000,000 go by default, the conditions that exist are unnatural, uneconomic and hurtful, to say the least.

STREET SCENE IN MEXICO CITY

A Good Investment.

The construction of the needed links in the Rail Road chain would seem a good business venture for the 20 republics of South America, the returns from which will evidently be very large. It will tie them together for the first time, and will be a live wire that will thrill each.

It will open not only intercommunication and trade, but will abolish the isolation and separation from each other of this great family of sister states. It will do for them what has made North America great; it will connect them by a great trade route and channel of commerce.

Wiping Out Local Lines.

Instead of the existing Rail Roads of the several South American countries being only local lines, depending on the products of the immediately surrounding country for business, they will add, in some cases, probably 50 to 100 per cent to their tonnage in through traffic and much more from all sources later.

It will add to the business of every merchant, miner, farmer, cattle raiser and other producer, giving new and wider markets. Production of resources of the earth and manufactured classes of goods, now deprived of markets by excessive cost of animal and other transportation, will also be made possible.

The Stroke of the Century.

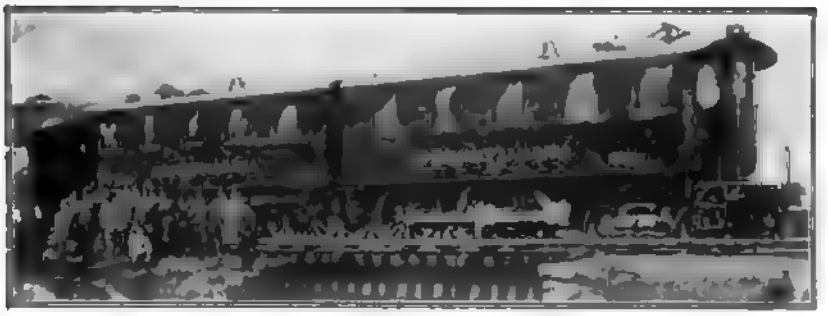
Politically and diplomatically, it will be the greatest stroke of the century, for diplomacy is no longer a matter of the mere juggling of words, or concealment of their meaning, nor even of the making of treaties, but the provision for and the enabling of facilities of mutual benefit and convenience.

Surely, in every way it will pay.

There is only one answer to the question whether these people will progress and prosper to as great an extent separated as when linked together.

Ways and Means.

The Pan-American Congress has given this matter diplomatic impetus, but the writer would like to suggest that the vitals of this important matter are not for the disposition of diplomats alone; it is a practical question to be settled best by trained bankers and practical Rail Road men. It is the biggest thing to be done for New World Progress and Prosperity.



A TWO-UNIT ELECTRIC LOCOMOTIVE, PENN RY

SECTION XXXIX.

ELECTRICITY VERSUS STEAM.

Greatest Development.

The most important motive power advance in Rail Roading, and one which seems to afford the greatest opportunities for future improvement and development, is the substitution of electricity for steam.

It is little more than 10 years since the Baltimore & Ohio made the initial change to electric locomotives to operate trains through its tunnel under the streets of the city of Baltimore. There is a very heavy grade in this tunnel, but the electric engines are fully able to supply the great power required.

Others Follow.

The next important American installation of electricity on Steam Roads was on the Long Island Rail Road, 100 miles of track, and the next by compulsory legislation, but for the same purpose, i e., to do away with the smoke nuisance. The New York Central and the New York, New Haven & Hartford Rail Roads, in entering New York City, pass through a two and one-half mile tunnel, in which a wreck some years ago caused the death of many persons. The city thereupon passed an ordinance requiring the installation of electricity.

The New York, New Haven & Hartford is the most noteworthy example of electrification suited to high-speed trunk line service. The alternating current system is used throughout, being supplied

direct from the power house with an overhead wire. It is operating most successfully, although the initial service encountered difficulties incidental to a new system. The service now extends to Stamford, 35 miles from New York. Freight locomotives are in operation, the six-track Harlem branch and the remaining four-track road to New Haven are being electrified, and it is said that the New Haven will shortly equip its line electrically through to Boston.

Greater Capacity.

The New York Central's 34-mile section of electrically equipped four-track road entering New York City has been in operation about five years. It can hardly be said that it has been more than tested, but it has been found that the electric locomotive allows of greater weight of trains; the speed within city limits is increased, and it is, therefore, possible to handle more traffic. The abolition of smoke in the tunnels and the element of added safety are other important advantages.

The most important steam railroad electrification in the world by reason of the tunnel grades and powerful 4,000 horse-power locomotives is the Pennsylvania extension into New York City.

Western Electrification.

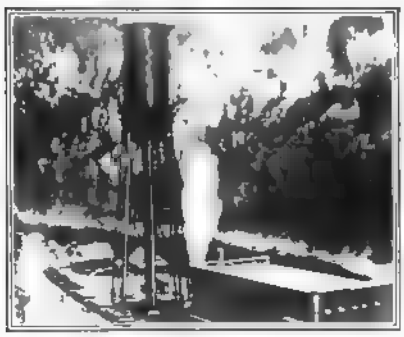
The St. Paul, it is said, plans to electrify the Cascade division of its Pacific coast extension; the Central Pacific also is understood to contemplate extensive electrification in its mountain sections. Each will have the advantage of cheap water power to produce the current.

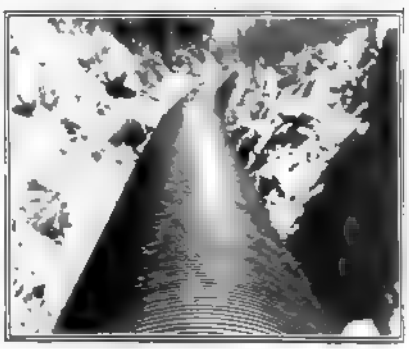
The greatest practical value of the change, however, is in the ability of the electric locomotive to exercise a greater draw-bar pull. This is brought out by comparing the figures for two typical engines. The Pacific type of steam locomotive weighs 171 tons, of which 70 tons are on the drivers. The electric engine also has 70 tons on the drivers, but weighs only 95 tons. Both are designed for a speed of 35 miles an hour.

Uphill Work.

The steam locomotive has a maximum starting effort of 35,000 pounds, and is able to exert this maximum pull or tractive effort up to about 15 miles per hour. Beyond this, it labors under difficulties. At a speed of

PENSTOCK LINE FOR ELECTRIFICATION OF CASCADE TUNNEL





GT NOR HYDRO ELEC PLANT FOR CASCADE TUNNEL

ELECTRIC TRAIN BEATING A STEAM DRAWN TRAIN

POWER CANAL, NIAGARA.

20 miles an hour, the tractive effort is about 30,000 pounds; at 25 miles it is about 24,000; at 30 miles it is about 19,000, and at 35 miles an hour is only 16,000 pounds.

On the other hand, the electric locomotive has the same starting effort of 35,000 pounds, and having a power house of practically infinite capacity behind it, is able to draw upon it as on a reservoir, exerting its full hauling power at all speeds up to 35 miles an hour. At 40 miles an hour this electric locomotive is able to exert a tractive effort of 20,000 pounds as against only 14,000 pounds of the steam locomotive.

Reserve Power. A graphic illustration of what the power house means to the electric locomotive as compared with the value of the coal pile to the steam horse, was afforded when a Lake Shore Limited, consisting of nine heavy Pullman cars, hauled by a steam locomotive, broke down on an upgrade in the tunnel under Park Avenue in New York City. An electric locomotive immediately following, without dropping its own load of a local train of seven coaches, pushed the crippled limited without any apparent effort for a mile up the tunnel grade, varying from one-half to one and one-fifth per cent.

Getting Up Steam. The electric locomotive is able to accelerate, or start, faster than the steam engine, and consequently makes better schedules possible without an increase of the maximum speed.

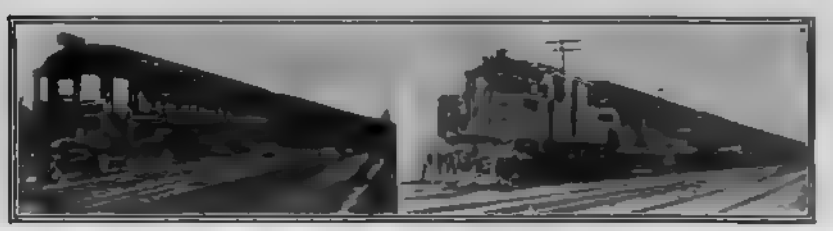
In handling the heavier trains, the speed of the electric locomotive also seems to promise superiority to the steam engine. A race between an electric and an apparently well-matched steam locomotive, each drawing a train of cars, held on a six-mile section of the New York Central main line, was easily won by the electric locomotive, although the train hauled by it weighed 307 tons against only 256 tons hauled by the steam locomotive.

Under favorable conditions a speed of 75 miles an hour has been attained in service and a speed of 85 miles reached on the testing track, while the New Haven locomotives have exceeded 90 miles an hour.

More Economical. Among the important points demonstrated on the New York Central are a net saving of 19 per cent in repairs and fixed charges, and, as less time is spent in the shops, greater service efficiency.

The saving in the avoidance of coaling, watering, and drawing fires, together with inspection and repairs done away with, represents a saving of four hours per day, in the greater time capacity of the engine.

Power House. The labor cost of coal hauling and firing is reduced greatly, as the coal is received either in cars or in barges, automatically unloaded, and, passing through crushers, is delivered by means of elevating buckets into storage bins over the boilers, thence passing steadily to automatic stokers in quantities of considerable magnitude. After the coal has been burned, the ashes drop into cars, which move away automatically. Neither the coal nor the refuse and ashes requires manual handling.



TWO TYPES OF ELECTRIC TRAINS, MULTIPLE UNIT AND LOCOMOTIVE-DRAWN, NEW YORK CENTRAL.

How a Rail Road Is Run by Electricity.

The electric locomotive usually derives its power from coal, save in the exceptional cases where hydro-electrical power is available. The difference between electric and steam locomotives, therefore, lies in that the fuel for the former is burned under stationary boilers in a central location or power house, while that of the latter is consumed on the moving locomotive.

Creating Electricity. The steam in the power plant is expanded and forced against the blades of turbines, causing them to revolve at high speed. A familiar example of the turbine is the mill wheel, where water, instead of steam, strikes the blades of the wheel and revolves it. The steam, after it has been used, passes into condensers surrounded by cold water, where it is reduced to water again and pumped back to the boiler at nearly boiling point. It being used over and over, a large proportion of the cost of water is saved.

The "field" revolving at high speed, within armature coils, generates electricity. From the generators the current is carried to the overhead wires for the alternating current system, and to the switch house for the direct current system. By means of switches,

the power is transmitted over the wires to the various points of distribution and from them to the main transmission lines at high voltage, thence to the sub or transformer station, where it is stepped down or reduced in voltage for use upon the electric locomotive.

At each main and sub-station is an electric storage battery which acts in the capacity of a reservoir. Each storage battery has sufficient reserve electricity to operate its section of the road for an hour or more, and the generators and station might be out of commission meantime without affecting the operation of the road.

Regulation of Current. These batteries also act as governors or regulators, preventing the current from going up and down, as is frequently to be noticed in street cars by the alternate dimness and brightness of the lamps.

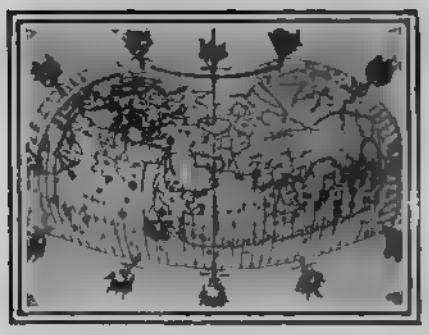
From the third rail or overhead wire, the current is delivered to the shoes or overhead contacts, which are like feet and hands reaching out and touching the feed lines. After being used in the locomotive, the return current is passed back to the power house, and consequently there is a continued cycle of current in and out of the power house.

Motor Cars. Short-distance or commuters' trains on the Long Island and New York Central have motors in each car so arranged that the motors in all the cars can be operated by one motorman, by means of what is called a multiple unit system. This system does not require a locomotive.

While electric operation is economical, the enormous outlay involved in power stations, overhead or third-rail installation, transforming stations, motors and many other items, goes far to offset the reduced cost. The change only pays where there is very heavy traffic and where the power can be produced cheaply.

Having brought the story of transportation up to its latest word, let us call to mind the concrete benefits it has brought to us in every-day life.

MULTIPLE UNIT ELECTRIC TRAIN ON N. Y., N. H. & H. AND OVERHEAD CONSTRUCTION



A GREEK CONCEPTION OF THE WORLD. THE HEADS INDICATE THE WINDS. THE SECOND OLDEST MAP IN EXISTENCE.

SECTION XL.

THE GOLDEN AGE.

Looking Backward to Gain a True Measure of the Progress and Prosperity of the Present.

Why We Look Back.

In completing our story of progress and prosperity, having dealt in detail with the active forces and mechanical mediums that man has discovered and put to use as his assistants, let us estimate the practical, social and economic results which have already been achieved and see what we may reasonably expect from their further development. Before venturing to draw aside a corner of the curtain hiding the future, we must review the past, in order to get a true perspective, and bring ourselves to a realization of the present. When we fully understand how astonishingly slow was the early progress of mankind, and how benighted its condition until the past century, we will better appreciate what amazing advances have been made in recent years, and what numerous and wonderful blessings we are enjoying to-day.

The ancients pictured in their mythology a period of vastly better surroundings, of much greater comfort, of an ideal existence—and called it the "Golden Age." Since then, the golden age has come to mean the period of the world's greatest progress and man's most advanced prosperity. Let us see how far we have proceeded towards the real golden age.

A Dreary Picture.

The picture of the life of the earliest man is so dreary, and must necessarily be painted in such sombre hues, that one hesitates to view the conditions of hardship, privation and misery that then existed. We must realize that earliest man was without shelter, covering, heat, light or any store of food; and that his children were born and reared under the same conditions as the young of the beasts of field and forest.

How Primitive Man Lived.

The early races lived in the dark and damp of caves—natural or artificial—and slept with only a few leaves or rushes between them and the rock of the cave floor. Before the use of fire was known, man's food was perforce eaten raw, and the coming of night left him sightless and placed him in danger from the carnivora. He may have used fire obtained from natural sources, such as lightning and volcanoes, thousands of years before he kindled it himself artificially by the physical effort of rubbing sticks together or striking flint. The sacred fire, preserved by many religious sects to-day, and even worshiped, is but a relic of the communal fire that was always carefully guarded and kept alive so that the members of a tribe might light a brand and carry it to their own huts.

Naked and Without Utensils.

The Bible tells us that man was naked and that he made his first clothing of leaves. The next step toward clothing was doubtless the use of the skins of animals. They were, for many years, rough and coarse, until man learned to soften them by beating with stones or rubbing until flexible. Before vessels were known, man, like the animal, had to seek the nearest source or stream, whenever thirsty, and there drink his fill.

A GREEK GALLEY WITH OARS AND SAILS
THE OARSMEN WERE USUALLY SLAVES

Man's morals were doubtless little above those of the animal; he probably mated with woman as one animal mates with another; parents paid little attention to their offspring, who had to shift for themselves after they had grown to fair size, family life had hardly begun. Woman was then the beast of burden for the human race.

It took man many thousands of years to grope his way over

the long and devious path which led from the stone age and those of copper and bronze to the civilization of the first historic nations.

An Age of Parasitism.

The physical work of classical civilization was done in part by beasts of burden, but to a much greater extent by slaves. It was a time of luxury for the few and want for the many. It is well to recall that at the height of her glory Athens had about 20,000 voters, as against 100,000 slaves. In the days of Rome the middle class was forced out of existence by the competition of the thousands of slaves belonging to the great estates of the oligarchy. The so-called civilization of Greece and Rome was only a purple patch on a Sahara of savagery and slavery.

Man's Condition in the Mediæval Age.

The Dark Ages.

After the fall of Rome, Western Europe retrograded to the semi-civilization of its barbarian conquerors. The world empire was broken up, and each petty tribal chief became a local lord and master. Intercommunication between separated districts came almost to an end, the roads fell into decay, and commerce largely disappeared. Outside of a few cities, imported luxuries were no longer known, and each community was forced to eke out an existence from its own resources.

Education was entirely confined to the church, and the general ignorance and superstition of the period were pitiable. Any man who could read could claim benefit of clergy and avoid punishment for his first crime, however heinous. Certainly not one in a hundred could then read or write.

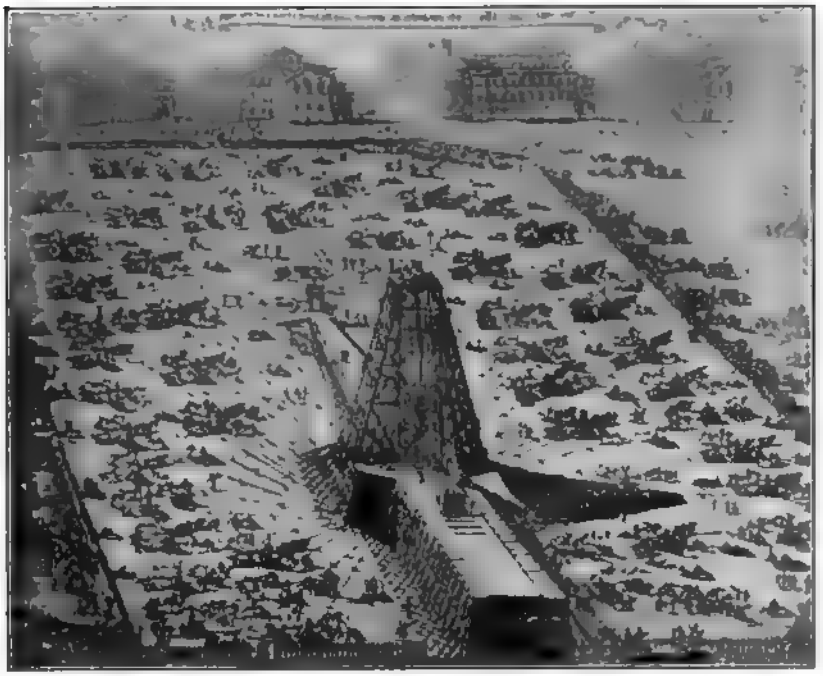
Printing—A Great Step.

Considering the long period we have hastily touched on, the modern era initiated by the discovery of America and by the invention of printing from movable type was only yesterday. But it is an almost inconceivable distance from Gutenberg's tiny press, or even that of Franklin, to the printing press of to-day, which is capable of turning out 300,000 newspapers an hour, eighty-three folded four-page papers a second, or 5,000 a minute. It is wonderful to think that the weekly founded by Franklin, and having in his lifetime a circulation of a few thousand, now prints and circulates more than one million nine hundred thousand papers every week.

How Miserably Man Lived Only Yesterday.

Farming in Unison.

Farming in the eighteenth century was done by the vassals of the domain in unison, each kind of crop being sowed by the peasants, all in a single field, each peasant working certain furrows assigned to him. The rude little plough was frequently drawn by men and women. Cultivated hay was unknown; consequently, natural marsh meadow was more valuable than tilled land. Winter vegetables, including potatoes, turnips, carrots and peas, were unheard of. The yield of all crops was not more than half as much per acre as at present. Horses in England were the size of mustangs. Sheep did not yield more than a third of their wool clip of to-day.



SIXTEENTH CENTURY ENGINEERING. RAISING THE OBELISK OF ST. PETER'S. THIS REQUIRED 800 MEN, 150 HORSES, WORKING WITH 46 CRANES. IT COULD NOW BE DONE BY A SINGLE ENGINE.

Pigsty and Parlor. The stable and pigsty adjoined the house, which was commonly the parlor alike of the peasant and of his domestic animals. Only the better class of yeomen, however, could afford any livestock whatever.

Meat three times a year was a bountiful average for the ordinary European peasant, unless he were a poacher. The only method of preserving meat was by salt, but even salt was expensive, being subject to a heavy tax in most countries.

Miserable Living. The floor of the peasant's home was of sanded dirt. There were hearths or fireplaces instead of stoves, holes or greased parchment in place of glass windows; few furnishings and utensils, and little to distinguish the home of the man from the stable of the horse. It is said, indeed, the peasant was considered well to-do if he had property worth thirty dollars.

The Laggard Progress and Prosperity of the Old World.

During the eighteenth century France was probably the most enlightened of the continental countries of Europe, so we will take her for an example of conditions of the time; in the rest of continental Europe the situation was worse, if anything. Yet the conditions in France before 1789, the time of her revolution, little more than a hundred years ago, almost stagger belief.

The peasant could be thrown into prison without a trial, and the lord himself was the judge. The peasant was compelled to do the lord's ploughing, sowing, reaping, threshing and general labor. Fully a third of his time was taken up by his work for his lord and master. He had to work the roads, build the bridges, and, when called on, go to war. He was compelled to have his share of the grain ground at the lord's mill, and pay heavy tolls therefor.

The Nobles Supreme.

France was cursed with a degenerate feudalism, as was practically all continental Europe about this period. The lords used much of the country as a game preserve. Vast tracts were entirely forbidden to the peasants, who were not allowed to plough until after the nesting season, because they might destroy the partridges, nor even to manure the soil, lest this injure the flavor of the birds. Deer might overrun the peasants' land, or millions of doves destroy their grain, and the human creatures might not harm them.

What a Day's Labor Brought.

The mason or carpenter in France received about 19 cents a day from 1700 to 1775. This was little more than was received by the skilled laborer or artisan of Greece 2,200 years before. Wheat during the same era averaged 91 cents a bushel. Thus he could buy only one and a third bushels of wheat with his week's labor The agricultural laborer was even worse off His average wage was but 14 cents a day, and he could not purchase even a bushel of wheat with his full week's wages. In many parts of France, the people, in want of grain, made bread of herbs.

So universal was illiteracy, that it is said that there are far more people in our New England to-day who can read and write than could do so in all Europe as lately as 1775.

Manufacturing Up to a Little More Than a Century Ago.

Manual Power Only Power.

Practically all manufacture before 1788 was by hand. The mill wheel, with water power, was used only for the grinding of grain. The very word manufacture means, etymologically, making by hand, by manual labor. The modern world has made it mean making by machinery.

Costly Wearing Apparel.

Until the invention of the spinning jenny, in 1770, the women of the house spun thread, a single strand at a time; the men of the house wove it on the loom by hand and foot power. Raw cotton was 56 cents a pound, and cotton yarn $7.68 a pound. Printed calico cost from 60 to 75 cents a yard, even as late as 1836.

Low Wages.

The hand spinner received from $2.04 to $2.28, and the weaver from $3.38 to $4.68 a week, from 1700 to 1775. In the same years, the price of wheat ran from $1.05 to $1.53 a bushel. Coal during this time cost from $6.52 to $8.34 per ton, or two and three times the week's wages of the weaver and spinner, respectively. The carpenter or mason received some $2.37 a week from 1700 to 1775

A Manifold Increase. The industrial revolution has multiplied again and again the variety and supply for all of this world's goods and conveniences. The luxuries of the few have become articles in common use by the masses. The carpenter, mason, and laborer can buy almost ten times as much wheat, or its equivalent, for their week's wages to-day as they could a century and a half ago.

A World Unfit to Live in. Pitt said that up to a hundred and fifty years before his time, the world was no fit place for a gentleman to live in. If it was not a fit place for a gentleman, it was surely a ten times worse place for the masses, as is indicated by the facts which have just been recited.

Strange as it seems, it may truly be said that the world up to that time had been for the classes; that progress was not born for the people as a whole until the beginning of the nineteenth century.

Desire for Happiness. After all, the *summum bonum* of human existence is happiness, and one of its most important requirements is that the natural demands of our bodies be fully and abundantly satisfied. The conditions we have briefly passed over may be roughly said to cover five periods of man's existence, each a step upward: the sunken past of prehistoric man; the stone age, and those of copper and bronze; the so-called civilization of Greece and Rome; the Dark Ages; followed by the Mediæval period, and including even the eighteenth and part of the nineteenth centuries. Few of us would want to go back to and live amid the conditions, and as one of the people, even of the best and latest of these past periods, to say nothing of the earlier and cruder ones.

INDIAN WEAVING. INDIAN BREAD BAKING
MODERN COSTUMES

The Comfort and Luxury of the Present.

The Amerinds and Their Arts. When America was discovered, manufacturing among the Amerinds was limited to the making of spear and arrow heads, some rude pottery, and, in spots, the weaving of baskets and a little cloth, for our American aborigines had few arts. The first American home was a hut or tent, only one story high, and with but a single room. Now our homes have many rooms, each for a separate purpose. We

build our houses one above another, to the number of twenty and more, and have office structures up to fifty stories in height.

Cliff Dwellers of the Present. The modern cliff dweller rises to his home on an elevator or moving floor, a veritable magic carpet, without the slightest effort on his part. We get our light, heat and power from unseen sources, without visible combustion, and turn them on or off at will. We sit in luxury, with carpeted floors and upholstered furniture, in the temperature of June, and look out of our windows upon a wintry landscape. In the heat of summer we have at command, through refrigerating conveniences and powerful fans, the ability to temper the air and cool it to our liking.

Modern Luxuries and Conveniences. Hot and cold water rise to our level and flow at our touch. Sanitary plumbing makes possible the utmost cleanliness, among comforts of which the man of mediæval times never dreamed. Indeed, Lecky designated the Middle Ages as "a thousand years without a bath."

Numberless conveniences and comforts, all of modern invention, minister to our wants. Ours is indeed a Golden Age—a good time and a good world to live in, and our country the "Land of Fortune."

[illegible] CENTURIES OF CONTACT WITH CIVILIZATION, YUMA, ARIZONA

The Age of Mechanics, Inventions and Facilities.

Inventions and facilities until the beginning of the nineteenth century were few, and industrial and mechanical appliances crude indeed. Very different has been the activity since 1790, the date of the founding of the Patent Office, since which time nearly a million patents have been taken out in our country alone. In fact, of the new series beginning in 1836, Patent No. 1,000,000 was issued in July, 1911.

Business Limited by Facilities. In the stage-coach and ox-cart days, it was impossible for an individual or a group of men to do a large business. A moment's consideration makes us realize that had our fathers been many times as able as ourselves, they could not have accomplished what their sons

can do to-day, for the important reason that they had not the machinery and facilities with which to supplement their mental ability.

It is no longer the body, but the mind, that does business. Electricity has enabled the message to travel without a bearer and independently of the body. Intercommunication has developed the radius of our activities from a few miles to one bounded only by the circumference of the globe. A modern business man in Japan can on Thursday price his wares in the United States, or ask for a quotation, and close his deal in America the preceding Wednesday.

The Day of Rapidity.

We live in the days of harnessed lightning and truly rapid transit, not only for messages, but for men and products. While the writer was re-reading the above paragraph, he happened to be making a journey westward, and noticed this sign of caution to engine drivers, in large letters, along the side of the road of steel over which he was speeding:

"Express trains must slow down to fifty miles an hour."

Only a day or two before, in going through the plant of a large New York trucking and forwarding agency, the proprietor called his attention to various cars of ordinary non-perishable freight, that had been shipped on Thursday in far away Ohio, Indiana and Illinois, and were delivered to the buyer in his New York store on the Monday morning following.

Such a feat—which is an ordinary, everyday occurrence—would have been a miracle beyond the conception of the merchant or producer a hundred years ago.

Unappreciated Wonders of To-day.

We can hear from friends by telegraph under the seas and by wireless over the seas. By the telephone we can talk from our own fireside to friends at theirs, and transact business hundreds and even thousands of miles away. The camera enables us to obtain and preserve accurate and life-like pictures of our friends, and of landscape scenes in nature's own colors. Even the humblest enjoy the singing of the world's greatest artists. We can enjoy the music of any instrument or of a brass band or a symphony orchestra in our parlor. We can stay in America and witness every movement of participants in and spectators of the great Coronation Pageant in London. We can see the movement and life of the people in any part of the world, and enjoy almost all the advantages of a journey which would be the event of a lifetime, for a mere trifle, while remaining at home in the United States.

HOUSE OF PARLIAMENT (THE REICHSRAT), VIENNA.

SECTION XLI.

OUR OWN THE FIRST AGE OF REAL PROGRESS AND PROSPERITY.

Man's Intellectual, Religious and Political Emancipation.

Man's physical, commercial and industrial progress we have elsewhere dealt with and just now very briefly summarized.

Freedom and Liberty.

Of almost equally great importance and still more startling is the recent acquirement of freedom and liberty, in many forms, for the masses of the world. Political enfranchisement as well as freedom to print, of speech and of conscience have all become prerogatives only in our own generation. Surprising as it may appear, it was our own Thomas Jefferson, practically within our own time,

First Statute for Religious Freedom.

who secured the enactment of the first statute granting real religious liberty. To him we are also indebted for the authorship of the great Declaration of Independence, which carried with it our own right of free speech and of political freedom, and which has also served as an inspiration and example and leaven of liberty to the peoples of many nations of the Old World to demand of their rulers a share of self-government.

Of Recent Origin.

Wonderful as the statement seems, man's real political emancipation did not come until well within our own times. The right of popular franchise under a constitutional government is so new as to be but in its infancy for more than two-thirds of the people of the world; it is only in the past half-century that it

has become a reality in the principal countries. Of the fifty principal governments of the world, only four remain absolute monarchies—Abyssinia, Afghanistan, Morocco and Siam.

In Germany, in 1867, the first permanent constituent diet of the Confederation of States, elected by universal suffrage, met in Berlin; in France, 1875 saw the definite recognition of a constitutional republic by the National Assembly. A Reichsrat for the Austro-Hungarian empire was established in Vienna in 1861, but only in 1867 were the political and civil rights of the citizens definitely stated. In Italy it was 1871, and in Spain 1890, before universal suffrage was effective.

Not Easily Obtained.

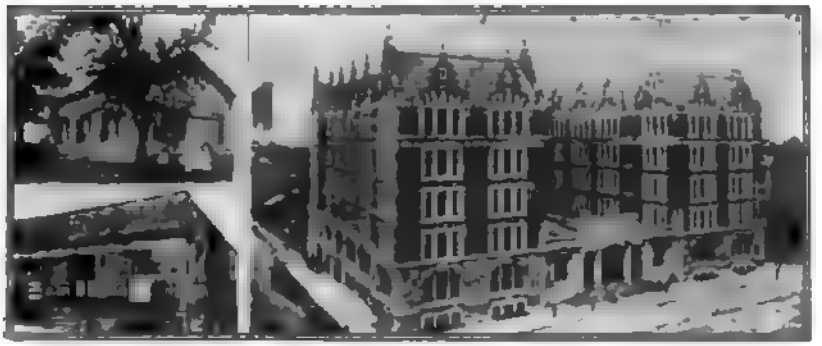
In the rest of Europe, the past two generations have practically been the first to obtain a constitutional government. To Russia, constitutional government has come within the past ten years, and when China obtains her constitution, which is pledged to her by 1913, but which many say will come even sooner, more than a thousand millions of the fifteen hundred million people of the world will be enjoying political liberty for the first time.

PROGRESS IN POPULAR EDUCATION.

Public Schools a Product of Modern Progress and Prosperity.

The Introduction of Public Schools.

One of the paramount influences for advancement and development, both intellectual and moral, is popular education. Public schools are institutions of very recent origin, as we shall see. France made its initial provision for public schools only in 1816, but they were so inefficient for many years as to bear little comparison with the public school system of to-day. Belgium followed in 1842, Holland in 1857, and England did not pass a general education law until 1870. In Germany popular education was taken up by the various duchies and principalities at various times, but only since the middle of the past century has it become universal.



THREE ERAS OF PUBLIC SCHOOL BUILDING, NEW YORK CITY.

COLUMBIA UNIVERSITY, N Y MAIN BUILDING, CITY COLLEGE OF NEW YORK

The Progress of Public Education.

The progress of public schools of late has been very rapid. The elementary schools of Europe have substantially 47,000,000 pupils, while those of the United States have about 18,000,000, with 2,000,000 more in our colleges and universities. It would appear that the United States leads in this, as in many other things, for Europe, with a population substantially five times ours, sends only about two and a half times as many children to school.

School Statistics.

The problem of education is of such vast importance that it is interesting to follow the growth of education in the past four decades, and also to see how greatly the system has expanded. In 1870 the enrollment of our public schools was 6,871,522, the number of teachers 200,515, and the total expenditures $63,396,666. In ten years, or by 1880, the number of pupils had risen to 9,867,505, the teachers to 286,593, and the expenditures to $78,094,687. In 1900 the number of pupils had risen to 15,503,110, the teachers to 423,062, and the expenditures to $214,964,618. In 1908 the number of pupils was 17,061,962, that of the teachers just short of half a million, 495,463, and the expenditures $371,344,410. There were, in addition, over 1,300,000 pupils in private schools. In 1910 the expenditure on public schools was $401,000,000, the number of teachers considerably over half a million.

Higher Education.

How great these sums are relatively will be appreciated when we compare them with the total revenue of the nation, which in 1860 was only about sixty-one millions of dollars, or two millions less than the amount spent upon public education only ten years later. The amounts spent upon higher education have increased in an equal degree. The total income of our universities and colleges in 1900 was $65,000,000, which was more than the total revenues of the country fifty years ago, and than our total expenditures for education fifty years ago. It is interesting to learn that there are 497 principal colleges and universities in the United States, the value of whose productive funds is $260,000,000. The value of their buildings is $219,000,000 and of their scientific apparatus $33,000,000. Their libraries contain no less than 13,338,000 bound volumes. Our total expenditures for education are nearly two-thirds the revenues of the nation.

Other Educational Factors. The Chautauquas, the reputable correspondence schools, the Young Men's Christian Association, many parochial schools, and colleges supported by religious denominations, are important additional factors in the education of the people.

OTHER MEDIUMS OF ENLIGHTENMENT.

Libraries, Newspapers and Magazines.

Recent Additions. An important influence in the spread of enlightenment has been the growth of those great disseminators of information, public libraries, newspapers and magazines They give the not unimportant advantage and opportunity of obtaining amusement, cultivation and recreation at home.

It is of intense and surprising interest to learn how recent has been the acquisition of nearly all of those institutions which now form a most important and integral part of our higher life.

The Library. Our libraries are important factors in education and recreation, and in broadening the viewpoint of our body politic. They have grown from the early collection of cuneiform writings and records on brick and tiles of the Assyrians and Babylonians, followed by the papyri of the Alexandrian library and the manuscripts and missals of a later period. Necessarily, libraries up to the days of Gutenberg and movable type contained only works tediously written by hand, and even had both libraries and literature been abundant, as a rule so few could read or write that these privileges could have been taken advantage of by only a small portion of the people.

Famous Libraries. Among the famous libraries of the world are the British Museum, containing over two million volumes, the great National Library of France, with its two millions and a half of catalogue numbers, and the National Library of Congress, rapidly taking rank with the greatest institutions of its kind in the world

THE NEW $20,000,000 PUBLIC LIBRARY, NEW YORK CITY

The new Public Library of New York contains one of the finest collections of books to be found anywhere in the United States. It is of high international rank. The building and the ground on which it stands are valued at $29,000,000. The Boston library, with its three-fourths of a million books, that of Chicago, and that of Harvard, two hundred years old, with its half million books, are only notable instances of the great libraries to be found in almost any city of the United States.

Libraries of the United States. In 1873 there were 3,647 libraries in the United States, containing 12,000,000 volumes. Their progress and prosperity has kept pace with that of the nation, for in 1908 there were 5,640, according to the Commissioner of Education, which had 62,000,000 volumes, besides 12,000,000 pamphlets. In that year over 4,500,000 volumes and pamphlets were added to the libraries. Andrew Carnegie has done a vast deal of good in encouraging and assisting in the creation of new libraries and circulating branches all over the country, by giving buildings to any community desiring them which will stock and maintain them.

THE METROPOLITAN MUSEUM OF ART THE AMERICAN MUSEUM OF NATURAL HISTORY, N. Y.

Circulating Libraries. The circulating features of all but a few great reference libraries have made available recreation and improvement of the mind in the rest hours of the people of our country. Few can read any book without gaining something of value from it, and the multiplying of libraries means an increase of general information and enlightenment, with the infinite benefits that go therewith. There is scarcely a town of even a few thousand people which has not its public library with a thousand or more books.

Museums and Art Galleries. Our museums and art galleries are already becoming notable in some of our larger cities and are gradually spreading to the smaller towns; and the time seems near when it will be unnecessary for our people to spend millions annually to visit the art galleries of Europe for the purpose of satisfying the cravings of the eye for the beautiful.

REPRESENTATIVE NEW YORK NEWSPAPERS TYPICAL OF THOSE OF THE COUNTRY. THE PAPERS OF THE COUNTRY HAVE A CIRCULATION OF OVER 10,000,000,000 COPIES A YEAR

THE NEWSPAPERS.

Another potent and most important adjunct to enlightenment has been the growth and advance of the newspaper. Naturally, its progress and prosperity have gone hand in hand with intercommunication and the means of getting the newspapers to a larger number of readers. It has become an integral part of our daily life, as well as one of the most powerful influences in molding the nation's views. It is a great factor in our affairs, and, apart from its influence for the dissemination of news, has become an important industry.

A Marvelous Growth.

The first real newspaper in the United States was the "Boston News Letter," founded in 1704 and continued until 1776. In 1775, the year preceding its demise, it is believed that there were but thirty-nine newspapers all told in the United States. To-day there are about 23,000 newspapers and periodicals, an increase of 60,000 per cent. The total number of newspapers published in the world to-day is estimated at 60,000. The share of the United States is, therefore, about 40 per cent of the total.

The circulation of our newspapers and magazines has grown even more wonderfully than their number. For in 1775 the total circulation of all publications in the United States is estimated to have been 1,200,000 per annum. In 1810, the 359 papers then published had a total circulation of 22,000,000 per annum, while 21,394 newspapers and periodicals published in 1905 issued 10,325,000,000 copies during the year.

Growth in Size and Contents.

Thus our newspapers and periodicals at present issue twenty-three times as many papers in a day as were issued in a whole year in the United States in 1775. The proportion is further increased by the fact that many sheets of the old newspapers were not much larger than a good-sized pocket handkerchief. Most of our earlier papers had four pages each, and only a few had eight. It is highly probable that the amount of matter which the average paper prints to-day is ten times as much as that of the paper of 1775; in other words, there is now printed about two hundred and thirty times as much matter each day in our papers as all the papers in the United States printed in the year 1775.

A Later Comparison.

The average New York six-penny sheet in 1834 had a circulation of about 1700. There was then only one newspaper in New York City (and probably that was the only one in the United States) which had a circulation of as much as 6,000 copies. In 1905 the average circulation of the seventy-five newspapers in New York was over 46,000 copies. New York to-day has many newspapers each with a daily circulation of more than 100,000 copies, while one paper claims a circulation of 800,000 for its Sunday edition.

New York City newspapers have an aggregate circulation per

issue of 3,492,189 copies of from eighteen to twenty-eight pages each, as against 9,300,000 for the entire United States for the year 1834-35. The New York papers alone publish annually the equivalent of over 400 times as many papers as the whole United States only seventy-five years ago.

The Scope of the Newspaper. Practically each newspaper aims to present a complete record of current events, not only locally and of our own country, but of international affairs as well; each one has many departments, devoted to almost every branch of endeavor, to matters of personal and household interest, as well as literary subjects. It is doubtful if either Gutenberg or Franklin would survive the shock of seeing a modern Sunday newspaper.

With Our Daily Bread. Many Americans are so accustomed to getting their newspapers with their morning meals, that they would almost as willingly forego the latter as the former; while the man who gets his news from a weekly publication, or, perhaps, from several of them, is equally anxious and impatient for their arrival.

MAGAZINES.

The Weeklies. There are no less than 15,046 weekly publications, some of which are, of course, newspapers; but others are purely weeklies, dealing with some special subject, or devoting attention to general subjects, in which case a generous share of the space is usually given to politics. Trade publications of every kind, commercial as well as art, and the humorous publications, usually appear once a week. The total circulation of the weeklies was 1,872,000,000 copies in 1905. Some of the illustrated weeklies have an enormous circulation and are extraordinarily interesting condensations of public events, both in illustrations and in text. There is a large number of papers devoted to the interests and affairs of women.

The Monthlies. Scarcely less surprising has been the growth of the magazines in the United States. The monthly magazines, numbered at 2,500 in 1905, had a circulation of 49,000,000 copies. The magazine, as we know it today, is, if anything, a more modern product than the newspaper. The first American magazine was published in Philadelphia by Benjamin Franklin in 1741, but died within a year; the oldest one still issued is the "North American Review," which dates from 1815.

Each number of a modern magazine seeks to be a condensed library of choice and attractive reading; in fact, the word was first used in this connection to indicate its character of storehouse; each one is made up according to its own formula, and sometimes covers as many as twenty or twenty-five different subjects and lines of thought. Then there are special magazines, devoted to commerce, trade, fiction, current opinion, the various arts and an infinite variety of other interesting and instructive matters.

One of the chief features of the present-day magazine and illustrated weekly is the beauty and artistic manner of their production, which carries with it a refinement and artistic feeling that create new demands for attractive articles of all kinds to wear, as well as for the decoration of the home, thus adding to trade and creating an additional demand on factories and for labor.

POPULAR AMUSEMENTS.

The People at Play. The amusements of the world have expanded marvelously within the past few decades. A people who are so eagerly absorbed in their business or vocations that they are without proper amusements lacks a most important part of what should constitute a counter-irritant. By the amount of enjoyment and recreation making up the lighter side of life may be measured its cheerfulness and healthfulness or its over-exertion and tedium. It is largely true that the American plays as hard as he works. No people are more given to-day to the amusement habit than those of the United States.

The Metropolitan Opera House. The New Theater (now the Century). The New York and Criterion Theaters and Roof Gardens.

Theatres of Our Metropolis. Take New York, for example, the center of America's amusement field. It has about ninety theatre buildings, constructed in first-class style, and ranging in value from $100,000 to $3,500,000. This does not include the innumerable small halls for private and semi-public affairs and moving-picture shows. It is a far cry from this situation to, say a century ago, when there were probably not more than half a dozen theatres in the whole country, such as even a minor city could to-day surpass.

The theatres of New York City can care for 150,000 people at each performance, which is probably five times as many as the theatres of the whole country could have accommodated little over a century ago. It is said that in the season New York's amusement bill for high-class theatres is sometimes as much as $150,000 to $200,000 a night, while her bill for opera and other forms of music is not much below $5,000,000 per annum. But it must be recalled that New York has to cater to a large floating population, as few of our people visit her without going to some place of amusement within her borders.

A Generous Supply. In many towns and cities throughout the country fortunes have been spent on theatres and opera houses, and they are relatively almost as well supplied as New York In addition, most cities, great or small, have one or more amusement parks—Coney Island, the largest of them all, sometimes entertaining a crowd of 400,000 people on a Sunday or other holiday.

Motion Picture Plays. A modern form of amusement, its cheapest and most popular form, is the moving picture. There are said to be 25,000 moving-picture theatres in the United States, and their receipts are estimated at $1,000,000 a day. The charge for admission is usually only five or ten cents, so that even those of the most modest means can attend them; millions enjoy recreation in this form each day throughout the length and breadth of the land. There are between 30,000 and 35,000 actors in the United States. Probably 100,000 of our people are directly engaged in the occupation of amusing others

PROGRESS IN HEALTH AND LONGEVITY.

Reduction of the Death Rate. Amusements, however, can be indulged in, or, to be more exact, can be fully enjoyed only by those in good health. And here again we find that the world has made vast strides in recent years. In the early part of the past century, epidemic diseases swept over the country—diseases which are now practically unknown save where sanitary science is ignored. Smallpox formerly desolated nations; and during the reign of Maria Theresa it carried away one-third of the population of her realm. Now it is hardly feared. The death rate from typhoid has been reduced by fifty per cent. During the past fifteen years the fatalities from diphtheria have been reduced seventy per cent. Consumption is yielding to medical science and is no longer necessarily fatal. Infant mortality has been cut in half in many of our largest cities, as has the total death rate in the past thirty years. The advances in surgery have been equally wonderful.

During the summer of 1911 a ship from Italy entered the harbor of New York with a number of cases of cholera on board. Had this occurred a century ago, the entrance of such a ship into the harbor would have occasioned a panic, whereas to-day it caused hardly more than a ripple of excitement, so sure are we of protection, from this former scourge, through our health authorities.

The Results. All of this means an increase in average longevity and the difference between good health and activity and the weakness and impotence caused by frequent illness. In fact, sickness and disease have lost much of their terror. Our housing and ventilation and sanitation, particularly in the crowded portions of our largest cities, have shown a wonderful change. A famous physician recently said to the writer that, owing to wider knowledge of matters affecting health, the difference that

had been brought about in surroundings, in general health, in the nourishment and comfort of many classes of people, within his own time and knowledge, was comparatively "the difference between heaven and hell."

Hospitals. Among the many provisions which are nowadays made to aid in the preservation of health, is a plentiful supply of hospitals and clinics. New York alone has 130 hospitals, besides 172 asylums and homes. There are 2,412 hospitals and charitable institutions in Great Britain. No less than 2,737,000 patients were treated by voluntary hospitals in England and Wales in a single year. The aggregate stay in hospitals in France was 23,000,000 days in one year

TYPICAL MODERN HOSPITALS, ST. LUKE'S AND MT. SINAI, N. Y.

Benevolent Institutions. According to the United States census, there were 4,207 benevolent institutions in the United States in 1904, the cost of maintenance of which was over fifty-two million dollars.

It is interesting to see what proportion of the various charities is to be credited to the government, and to private benevolence and religious institutions. It will be found that while public institutions care for 9,513 orphans, private and religious asylums care for 83,374, so that the public asylums care only for ten per cent.

Public hospital beds care for only 20,604 inmates, out of a total of 71,000. Over a million patients are annually treated in them.

How Relief Is Afforded. The greatest proportion of charitable service by the government is done in cases of permanent homes for the poor and others unable to take care of themselves. There are no less than 46,513 inmates of public homes and asylums, out of a total of 78,000. Soldiers' homes, etc., add largely to this high percentage, which is even increased, in the case of caring for the deaf and dumb, 10,720 of whom are under the protection of public institutions, and 4,433 in private and religious asylums

The 1,493 hospitals taking care of the unfortunate in that year had no less than 21,000 nurses attached to their staffs, and 2,853 resident and 15,914 visiting physicians

There are charity organization societies in almost every city of importance in the civilized world, and tens of thousands of minor charitable societies.

Protecting the Child. Up to thirty-five years ago, there was hardly a law in the world checking or punishing cruelty to children, no matter how far it was carried, providing only that it did not result in death. To day there are laws in almost every country for the protection of children, and 830 societies in thirty nations to guard them from cruelty and unkindness. It is to the credit of the United States that we were the first to promote this movement. Its growth has been as phenomenal as it deserves.

Child labor laws limiting the age at which children might work, and restricting the hours of labor, have also been passed in almost every State of the Union and many of the countries of the world, all within the last eighty years.

Housing the Poor. The National Housing Association for improving the character of the housing of workers has recently been formed by representatives from some two hundred and fifty localities.

Business men in almost every section of the United States are giving their time to the amelioration of living conditions of those who suffer from poverty. Their directors are representative of the men who manage the largest fiscal institutions of the nation.

The annual death rate in certain places in Germany taken as typical for 1685—was over forty-three per thousand; in 1850, it was twenty-five per thousand in the same places; in 1902, the average number of deaths in Germany was but eighteen per thousand, but little more than a third of the highest figure.

Research the Enemy of Death. Great endowments for the study of the ills which flesh is heir to have made and will make still further and more successful battles against disease and untimely death. By means of sanitary engineering and knowledge, milk and other foods are now kept from contaminating germs and aid in the preservation of life.

For Better Living. The United States Steel Corporation, whose employés, with their families, number 1,500,000, has recently employed a physician, formerly the head of New York City's department of health, and who lessened the city death rate during six years to so great an extent that there are now 22,000 persons living at the end of each year whom death would have claimed during any year prior to his administration. With an ample staff, he is to look after and study the health of the employés of the company and teach them and their families how to avoid many menaces to health; how to employ the best and most nourishing foods; sanitation and care of infants; and how to better their physical condition in general, all without cost to the individual.

Our national government might well have such a department on a large scale, with a cabinet officer at its head.

BENEFACTIONS.

Contributions to Public Uses. There was never a period in the world when generosity and public spirit equalled that of to-day in the United States. The benefactions for the year 1909 totalled $175,000,000, and those of 1910, $125,000,000. A single benefaction in 1909, that of John S. Kennedy, for $30,000,000, ran the total up to a very large sum for that year. A $100,000,000 gift to public purposes by Mr. Rockefeller only awaits the sanction of Congress to be placed at work for good causes.

Many Givers. Two of our very rich men have each given away vast sums of money, their publicly known benefactions alone being estimated, in the case of Mr. Rockefeller at $155,000,000, and in the case of Mr. Carnegie at $154,000,000. In 1910 Mr. Rockefeller's public donations amounted to $5,332,000, and those of Mr. Carnegie to $4,016,000, so it would appear that hundreds of people, many of whom have never before been heard of in the annals of philanthropy, contributed the remaining $115,000,000 of this vast sum.

Giving While Living. One of the most interesting of the facts in connection with such gifts is that many of them are given in the lifetime of the donor, who desires to see himself the benefits to be gained from his gifts.

Doubtless two or three times this sum is given by smaller contributors, who give as much in proportion and deserve as much recognition for their widows' mites to the support of religion, charities, missions, educational funds, and the infinite number of other efforts for the improvement of the condition of mankind.

The Greatest Givers. The writer believes it is safe to say that the total amount given in public benefactions during an ordinary year in the United States does not fall far short of $500,000,000, for there are few of our adults who do not contribute something, in either an act of kindness or in a material way. This is nearly twice as much money as the total circulation of money in the United States in 1850.

When we realize that the total receipts of the government a hundred years ago were only $9,384,214, it will help us to appreciate how vast is this voluntary contribution to social and public service, and that we are not living in an entirely sordid world, and shows that this is a golden age, not only materially, but in helpfulness as well.

A TRAIN OF NEW MALLETS LEAVING THE CONSTRUCTION SHOPS

SECTION XLII.

AN APPRECIATION OF THE PROGRESS AND PROSPERITY OF THE PRESENT.

The Evolution of Comfort.

The wonderful and rapid evolution in material civilization and comfort, which has recently taken place, may be clearly traced to the new methods of production, intercommunication and distribution developed in the past century, following the application of mechanical power to manufacture and transportation. They have made many triumphs possible and point the way to a further increase and maturity of the resources, comforts, wealth and happiness of mankind. Let us see how others fare who are without these advantages. This may well be understood from the words of Mr. Clarence Poe, an American economist, traveler and student of civics and world conditions, who has just returned from a trip around the world. He says: "Ignorance and lack of machinery have kept Asia poor; knowledge and countless tools have made America rich."

Oriental Wages Increasing.

He tells us that even in the Orient the wages of skilled workmen have almost doubled, in a comparatively short time, and are still increasing. He likewise assures us that "Anglo-Saxon brains, coupled with machinery," can hold their own with the low wages of Japan and China. He believes that the cotton mills of the Orient, with wages only a tithe of ours, do not make any greater profits than our own. It takes many more of these people, notwithstanding the fact that they have machinery, to produce the results of the same equipment in America, since education and intelligence count for much, even in the use of machinery. The exports of Germany, Great Britain and the United States are increasing faster than those of Japan, though her wages are only nominal.

To-day's Labor Conditions and Rewards. There has never been a time since the world began when labor brought so great a reward, not only in dollars and cents, but in the ability to purchase many comforts and even luxuries now lying within the reach of the means of the many; and all this with shortened hours of toil.

PIONEER AGRICULTURAL CONDITIONS OF THE PRESENT

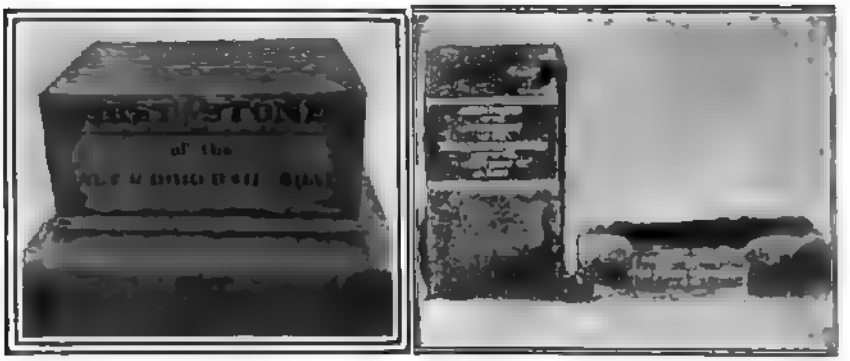
THE DIVERSIFICATON OF INDUSTRY.

Let us look into the story of our industries and see how we have changed from a nation of farmers to one of diversified industries and interests.

The Growth of Our Cities. You will be dubious when told that in 1800 there were only six places or cities in the United States that contained 8,000 or more inhabitants—only four per cent of our population at that time. By 1850 these had increased to eighty-five cities, containing twelve and a half per cent of the people. In 1880, there were 286 cities, containing twenty-two per cent of the people, and in 1900, five hundred and forty-five. Nineteen hundred and ten is not yet reported on this line, but it will unquestionably show a great increase in number of and growth of our cities.

Why the Existence of Cities. Our census returns, however, of the larger places are sufficiently complete to show us that in 1910 we had nineteen cities of over 250,000 each, and have at least thirty one of from 100,000 to 250,000, and 178 of from 25,000 to 100,000, a total of 228 of 25,000 or more.

There is a reason for these cities and for their existence and their inhabitants are neither drones in the hive of our industries nor parasites upon the body of the people. As the manufacturer must have lands, and people must get together to trade and transfer goods, so we have as a natural outgrowth of the demand the cities. They are commercial necessities in the great scheme of man's affairs.



CORNERSTONE OF B. & O. R. R.

THE CORNERSTONE AND A FROG OF THE FIRST RAILWAY IN THE U. S., THE GRANITE RAILROAD, QUINCY, MASS.

Our Great National Change in Occupations.

From Nation of Agriculturalists.

Let us glance at the change—in fact, the revolution—in our occupations in less than a century. In 1820, 83.1 per cent of the number of people employed in the United States, or 2,068,958, were engaged in agriculture; in 1900, these had increased practically five times, to 10,381,765.

The Growth of Manufacturing.

In 1820, there were engaged in manufactures and trades, 349,326 people; at that time farmers outnumbered them six to one In 1900, those engaged in manufacturing and mechanical pursuits had grown to 7,085,309, or twenty-fold In other words, the number of persons engaged in manufacturing increased four times as fast as those in agriculture. This may not have been from choice entirely, for the famous engineer, John Stevens, writing about 1815, said that at that time the cost of marketing farm products was substantially fifty per cent of their value, which must have left profits meagre.

It will be seen, in other words, that the nation has varied its industries as the farmer has his crops. We no longer have all our eggs in one basket The farmer, of course, has increased his efficiency, enlarged his output and decreased his cost by his knowledge and use of modern tools and machinery, both for making and marketing his crops, for he is utilizing the roads of rail that were built for him.

Vast Increase in Trade and Transportation.

How trade and transportation have increased is perhaps best told in the number of men engaged in these occupations In 1820, there were only 72,486 persons engaged in commerce, while in 1900, there were 4,776,964 people engaged in trade and transportation. The volume of the nation's output and the vast increase of production are graphically shown by the increase of this class of

people in the community sixty-fold. There are, also, with their families, in the class consuming the products of both farmer and mechanic and those engaged in manufacturing, 7,839,397 people engaged in other service and the professions.

But there is a greater lesson still to be gained from these figures than any of the above. In 1820, only one man out of six was not a farmer, and was non-competitive with him. In other words ,there was only one non-producer of his own food, or strictly speaking, only one family purchasing the farmers' products out of every six families in the country. Conditions have changed so greatly that there are now nearly eight out of nine persons non-competitive with the farmer and consumers of his crops. It will readily be seen that had the old conditions continued, and had our 92,000,000 people, or even 80,000,000, including dependents, remained engaged in or supported by farming, there would be a poor market for the farmers' products.

THE FIRST WOOLLEN MILL IN AMERICA, 1811

The Growth of Manufacturing Establishments.

Let us look a little further into the new but tremendous industries of mechanics and manufacture, taking up the situation as it existed only forty-five years ago. In 1860, the total number of manufacturing establishments in the United States was 140,433. In 1905, they had increased in round numbers four-fold, to 533,769, while the capital employed in them had grown from $1,009,855,715 to $13,872,000,000, or more than thirteen fold

The Number and Wages of Workers.

The number of employees, excluding officers and clerks, had grown in forty five years from 1,311,000 to 6,157,751, or nearly five times, and their wages from $378,878,246 to $3,016,711,706, almost nine times, or, including officers, clerks and helpers, to 6,723,926 persons, and the total wages to $4,025,911,959 a disbursal of wages nearly tenfold as great. In other words, the aggregate disbursement increased on the average nearly two and one-half times every ten years.

The Cost of Materials.

The (of from 1860 to 1905 n ,092 to $9,497,619,351, or nine fold; of the output from $1,885,961,- to 5, or nine and one-half times. 1 st resting figures to get the full s r.

Average Capital per Establishment.

We frequently hear that this is not the age of opportunity for the young man or the man of moderate means. Yet the average amount invested in these manufacturing establishments, including our greatest manufacturing corporations, was only $2,410 in 1905. It would seem that several young men, with initiative, could raise enough money to start themselves in a manufacturing enterprise without great effort

Number of Employees Only Twelve.

We are also assured that our manufacturing is all done by great corporations, and that they have swallowed the little enterprises. Yet, in 1860, the average number of wage earners per factory was nine, and in 1905 it was only twelve. In other words, the average number of hands employed increased on the average less than *any other* of the factors of these industries

100 Per Cent. Increase in Wages.

It is difficult to ascertain what average factory wages were before 1860, but it is safe to say that they were lower before that time than since, and the most important fact to be deduced is that the average wage was $289 in 1860, and is estimated to have about doubled by 1911.

How Our Industries Are Interdependent.

The farmer no longer weaves his own cloth, nor does the man in the factory raise his own grain, meat and vegetables. Each specializes and buys from the man who is properly equipped and can produce and sell the cheapest. In the same way, no farmer to-day wants to use his team in carrying his produce to any but a very near market. He turns it over as quickly as he can to the man best fitted to do that work.

The Great Machinery of the Nation.

The farmer to-day who produces a crop in Kansas or Nebraska, if he had to transport it himself to Chicago, to find his market, would be as badly off as would be the manufacturer of shoes or padlocks in New England, if he had to take each pair or box of them to Chicago or St. Paul to find his market. The public carrier will take a wagon load of the Nebraska farmer's corn to New York for $4.

An integral part of the great series of machines of the nation is that which does its fetching and carrying. In many mechanical operations it takes a dozen or twenty machines to complete the fashioning of a single article, and if any one of them breaks down permanently, the others are almost as useless as though they did not exist.

Payment for the Service.

How effective the transportation machine is and how cheaply it does its share of the people's work, is best shown by the figures of the Interstate Commerce Commission, from which we learn that the average amount paid for the transportation of one ton of freight, on our rails, whether from New York to San Francisco or for a shorter haul is only $1.07; and that the average passenger is hauled for sixty-four cents as far as he could conveniently walk in a day and a half.

We have four primary forms of business: Agriculture, transportation, manufacturing, mining. These are interdependent, and cogged like the teeth of a great train of intermeshed gear wheels, driving one from the other. We cannot clog or weaken any one without endangering all, as well as the mercantile, commercial, professional and thousand other occupations that rest upon or receive their impetus indirectly through these great driving wheels of the nation.

Trains Around the World.

How busy we keep this great machine, and the amount of work it does, is perhaps best illustrated by the fact that the train mileage of the United States would give us enough through trains to journey around the world at the latitude of New York, to have continuously moving trains arriving at or departing from it every four and a half minutes during twenty-four hours of every day.

An Essential Link.

In the great transportation machine rests the responsibility of gathering the raw materials of modern industries as well as of distributing them. Its problem of supplying food, shelter, clothing, and providing the fuel for heat, light, power and manufacturing, requires the most gigantic organization ever created by man.

The demand upon these essential machines has increased so rapidly that the question naturally occurs, What will happen in years to come? With the background of the wearisome past and the leaden-heeled development of the world up to the period of the introduction of mechanical power and transportation, let us see if we cannot get a glimpse of what the future is likely to bring forth, and to what extent it will be necessary to enlarge this machinery, to keep unclogged our arteries, facilities and means of transportation, so as to serve our needs adequately.

A 400-TON A., T. & S. F. LOCOMOTIVE. THIS IS SO LONG THAT THE ENGINEER IN ORDER TO SEE AHEAD MUST RUN IT BACKWARDS.

SECTION XLIV.

LOOKING FORWARD.

The Progress and Prosperity of the Future.

Search Into Past Records.

Few things are more fascinating than weaving from the warp and woof of the past the fabric of the future. There is no problem into which we may delve deeper, and none of wider scope and interest than one dealing with what almost any nation of promise will be thirty, forty, fifty years hence. The problem becomes still more interesting when its solution is undertaken with reference to the United States, which has so far set the pace in the race of the modern nations of the earth.

Keeping Within Bounds.

It seems doubtful if even the optimist can overdraw the picture of what the morrow of our nation is to be, for it is evident that the progress and prosperity of the past three-quarters of a century have been greater than that of all the twenty centuries preceding. With this marvelous recent pace, what of the future?

The story of this development has its essence and lies in the annals of transportation; it is written in the transference of man's work from muscle to metal. The speed of the lightning express is no more startling than the impetus which the world's evolution received with the advent of steam and the iron horse.

Our Bases of Estimate.

As the scientist, from a few random bones, reconstructs the marvelous creatures and species of past eons, so may we, with far more surety, build on the foundation of past facts the superstructure of future achievements. In order, however, that tight rein may be kept on our statements, we will content ourselves with building only upon and deducing from the stubborn facts and official figures of what we have already achieved.

Populating A Nation in Ten Months.

The governing factor, and one which is also of primary popular interest, is that of population, and we will treat it first. Our eminent historian, Bancroft, gives the population of our country as having been 1,260,000 in 1750. The continental population of the United States in 1910 was 92,027,874, an increase of 7,300 per cent in a period of 160 years, adding to the total every twenty-six months the entire enumeration of 1750. During the last ten years of this period, our nation, according to its enumeration of 1750, gave birth to another full-grown nation every ten months.

FORMER AND PRESENT HERALD BUILDINGS, NEW YORK

If we grow in the next ten years in the same proportion we shall have 111,000,000 continental inhabitants in 1920. In another ten years we should have 134,000,000, while in 1940 we should have 162,000,000, and in 1950, 196,000,000. In addition to our continental population, we already have 12,000,000 residents of our insular possessions, a total of over 104,000,000 The above estimates have recently been substantially confirmed by the estimates of a famous statistician The inhabitants of the islands have not been counted in our estimates of increases.

We Need Not Starve.

Large as this population is, there seems little need to fear inability to support it Japan supports 2,277 people to the square mile of cultivated land. Our 1,314,377 square miles of cultivated land, under the intensive farming methods of the Japanese, would probably

support 3,000,000,000 people at Japan's rate of consumption. It will therefore be very many years before there is any question of lack of support of our population, if even Japanese farming methods are adopted. Nor need we fear the wearing out of our land, for many oriental fields have been under cultivation since the time of Herod, and are still giving abundant crops annually. The Japanese can teach us how to care for land, use it, and not abuse or wear it out, for they put back something all the time for what is being taken away.

EARLY IRON WORKS, 1820.

Wonderful Increase in Production.

The Steel Age. In 1909, the production of steel in the United States was 24,000,000 tons, against a production in 1879 of only 1,000,000 tons, and of 10,000,000 tons in 1900; it is predicted by experts, on the basis of past growth, that the production will be from 50,000,000 to 60,000,000 tons by 1930.

Almost every month in the year 1905, the production of steel was limited by the inability of transportation companies to get any more of the raw materials to the furnaces. As approximately two tons of ore, two tons of coal or one and one quarter tons of coke, and one-half ton of limestone are necessary for the manufacture of one ton of steel or iron, and as almost all of this must be transported by rail, at least part of the way, it can be seen that if the necessary materials four years ago were too large in quantity for the public carriers to handle, a great extension of facilities must be created to take care of the expected development of this industry alone.

The Age of Concrete. In 1900, the production of Portland cement was 8,500,000 barrels, while in 1910 it is estimated to have reached 75,000,000 barrels, an increase of 780 per cent.

This industry, it is interesting to note, is yet in its infancy. Nevertheless, the present is sometimes called the "concrete age." The production of Portland cement, if the present rate continues, will be almost 500,000,000 barrels in the near future.

Gold Production. The total gold production of the world, from 1492 to 1860, was $4,117,286,000, that for 1910 was $454,674,000, so that the ten-year production now would be the equivalent of that in the long period of 368 years, the produc-

tion for the thirty-year period, 1881-1910, was $6,930,951,800, or one and two-thirds as much as for the long period. There seems little probability that the annual production will again fall far below the $500,000,000 mark in our time. The gold stock of the world will at least treble itself in the next generation.

Insurance.

Much can be said on the subject of insurance. Its activities cover a large field, and may be said to include a number of subdivisions. There are, for instance, insurance against infirmity and old age, insurance against unemployment; accident, life and fire insurance, and marine insurance, besides such smaller subdivisions as burglary insurance, insurance of special trades, such as of miners, etc., etc.

It is estimated that no less than 45,000,000 industrial policies were outstanding in the world in 1904. The total amount of life insurance in force in the United States in 1908 was $14,500,000,000, for 25,852,000 policy holders. The growth of insurance has been remarkable. Sixty years ago, in 1850, there were but 29,470 life insurance policyholders in the United States, insured for a total of $68,614,189. Now the payments to policyholders alone are a million dollars a day. Thirty-one million, three hundred and forty-seven thousand policies were outstanding in Great Britain in 1906, for a total of $5,175,000,000, and 7,678,000 policies in Germany, for a total of $2,500,000,000. Germany, however, had 21,172,000 accident insurance policies in force in 1907, and 11,689,000 sickness insurance policies, leading the world in this respect. In certain countries, accident insurance is compulsory for certain classes of workpeople.

The total amount of fire insurance outstanding in the United States has been estimated at the astounding total of over $32,000,000,000. This but another means of saving, and it will be noticed that the life insurance of the United States equals that of our entire bank deposits. These companies also have over $3,500,000 of resources largely belonging to the public.

The Rural Billionaire.

The farmer, too, judging from his rapid advance in the past, will not be laggard in increasing his production, to keep pace with the additional mouths to feed.

In the five years from 1900 to 1905, the value of farm property in the United States increased approximately $5,000,000,000. The 1880 value of farms was $12,180,000,000; the 1905 valuation was $25,000,000,000. The estimate of the present value is $30,000,000,000. On the basis of the $13,000,000,000, 110 per cent. increase in twenty-five years from 1880 to 1905, the 1930 value, with the new lands to be brought under cultivation, will be $51,000,000,000, and that of 1950, $94,000,000,000, over seven-tenths of the value of all our property as now given by Uncle Sam.

Confirmatory Figures.

Lest these figures seem extravagant, it is well to note that the value of farms in Ohio, Illinois and Wisconsin increased 80 per cent from 1900 to 1910; in Minnesota, North Dakota, Montana, Washington and Oregon, 118 per cent, and in Iowa, South Dakota, Nebraska and Kansas they increased 135 per cent, an average of 101 per cent in the last ten years.

A Nation's Cartage.

Wonderful as the story of the growth of population and trade is, and enormous as are the figures in which the statistician will have to deal in the near future, the rate of progress of these industries will be found only in the same proportion as the enormous increase in tonnage that will have to be carried by our Steam Roads. What is to be expected in this direction may be appreciated from a perusal of the history of the increase in freight handled by three of our leading Rail Roads—the New York Central, the Erie and the Pennsylvania—in the past fifty years.

RUNNING GEAR WITH MOTORS, OF MODERN ELECTRIC LOCOMOTIVE.

12,400 Per Cent.

These were the principal roads of the country a half century ago, and as their development has kept pace with the demands of commerce, it is fair in a much modified sense to base the expected growth of tonnage on their increase.

The three roads under consideration carried 2,017,092 tons of freight in 1856 and 251,872,011 tons in 1906. At the same time the average distance which each ton was hauled has considerably increased. Their traffic, it will be seen, increased 124 fold in 50 years, during which the population increased about three and one-half times, so that transportation requirements increased thirty-five times as rapidly as the people.

Momentous Increase.

Our Rail Road freight tonnage, from 1901 to 1907, increased 60 per cent. During the same period, the population grew about 12 per cent. The increase in freightage was, therefore, five times as rapid as that of our population.

The number of passengers carried one mile increased in ten years from 14,000,000,000 to 29,000,000,000. At this rate, the Rail Roads will carry approximately the equivalent of 64,000,000,000 people one mile in 1920, and 130,000,000,000 in 1930.

A Commercial Revolution.

What Hath God Wrought!

The great route of the world's commerce is in an easterly and westerly direction around the globe, and the Rail Roads of the United States are and will become, as time marks its cycles, more and more important links in the bonds of contact, and serve as an essential part of the greater highways of the world.

The Panama Canal.

The construction of the Panama Canal will put our eastern coast ports and manufacturing centers nearer to the Orient, by all-water routes, than the centers of Europe. Much European shipping will doubtless be diverted, and go westward instead of eastward, toward the Orient. The United States is destined to have many stations along this great water trade route of the world. Thousands of miles of our coast will be contiguous to and will avail themselves of the transit facilities of this great new trade route to new and wider markets.

Development to Come.

The commercial and manufacturing industries of the earth are but in their babyhood, and though apparently so stupendous in the United States, even here they are yet in swaddling clothes. Things we consider gigantic will be smiled at as puerile, and the commerce of to-day considered infantile in comparison with the vast industry of the future that is yet to be born of the workshops and industries of the world.

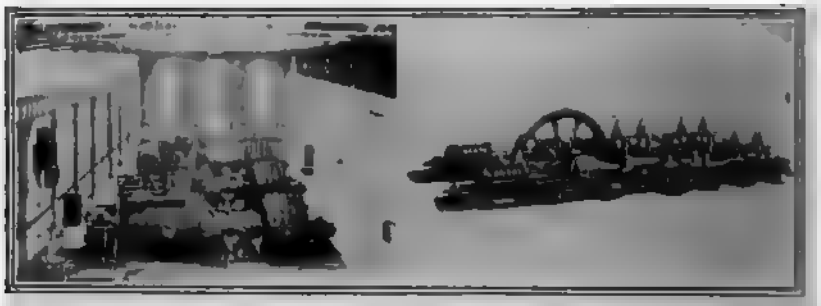
Realizing an Ideal.

To what bounds industry and science will lead us, it would be rash to hazard. We are still at the foot of the broad steps to the greater heights of prosperity to which progress is leading us. The spirit of enterprise is awake, and both home and foreign markets will make continued and increased demands upon our productive capacity.

Much of the city of New York has been rebuilt in the past twenty years. Even twenty-story structures, which were the pride of a decade or two ago, have been and are being torn down to make way for gigantic fireproof buildings, more in keeping with the demands of the present and the requirements of the future, and to produce a revenue adequate to the vastly increased values of the land. Within the next twenty or thirty years other cities will be rebuilt and new ones spring up throughout the United States.

Idealizing a Real.

The farmers' houses will be rebuilt also, modernized and equipped, first with acetylene gas, and later with electricity, as our water powers are developed. Running water and every other convenience of the city will probably be introduced, fed by wind mill or gas engine, merely supplementing the comforts with which the farmer already has been supplied. The automobile will be his every-day vehicle when it reaches the proper level of legitimate cost and profit. The city streets throughout the land will be paved, new roads built and all improved.



A BATTERY OF STEAM TURBINES OF THOUSANDS OF HORSE POWER

A 5,000 HORSE-POWER GAS ENGINE.

To-morrow's Requirements for Progress and Prosperity.

The Limit Reached.

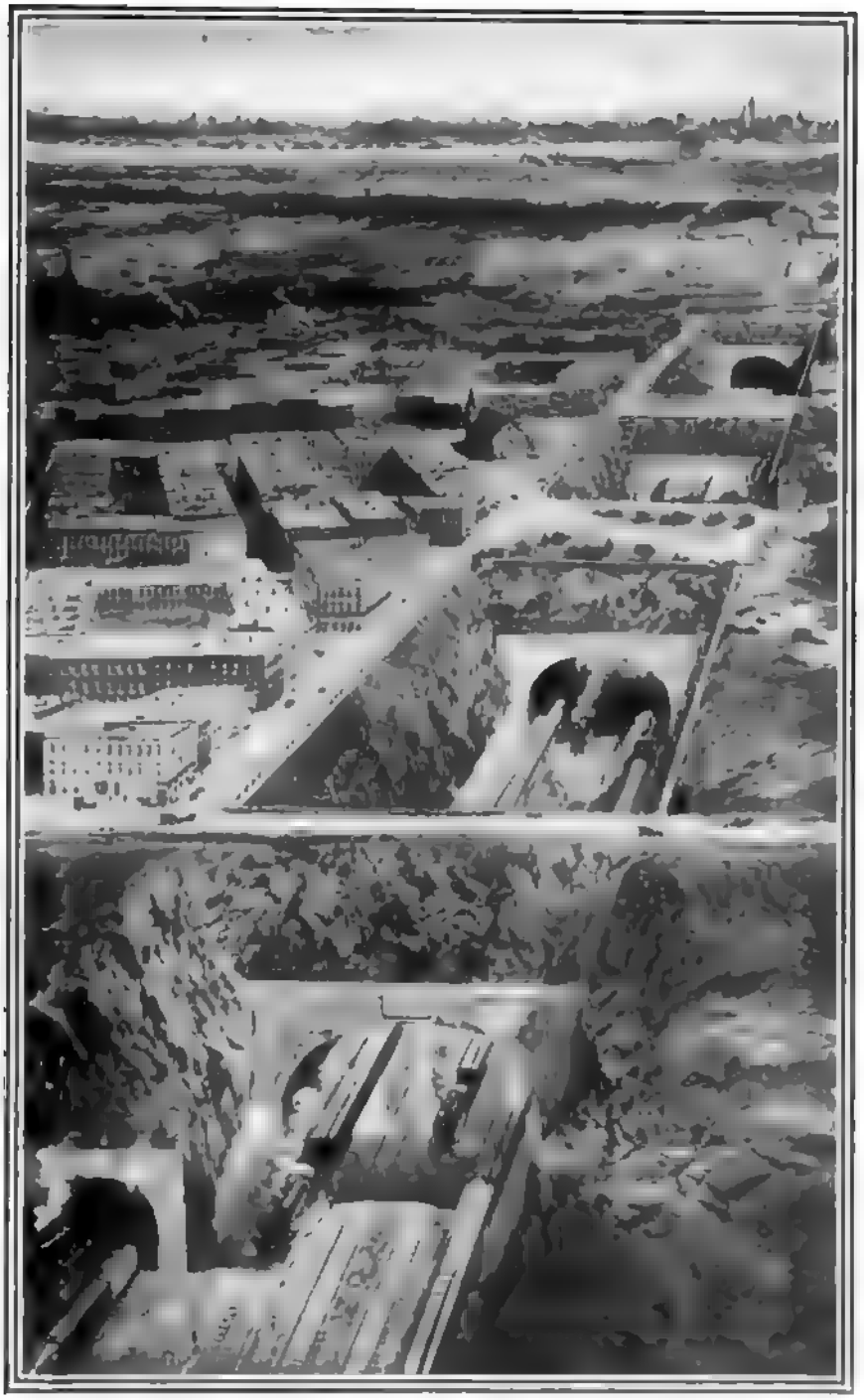
We know that in busy years the carrying capacity of our Steam Roads is already overtaxed by the traffic to be transported. Great additional facilities must be erected to provide for extensions of our trade. The choice lies between progress with these facilities and stagnation of our development without them.

The rate of construction of new Rail Roads for the eight years preceding the panic of 1907 was 9,700 miles per annum; for the past five years, even including the period of stagnation due to the lack of money at reasonable rates, with which to build, the rate has been an average of 8,695 miles per annum. Of the mileage constructed in the past five years, 21,142 miles were second, third, fourth, side and terminal tracks, leaving a net gain in new lines of only about 2,400 miles a year, although we frequently built 10,000 miles of new line a year even thirty years ago. The additions to track in 1910 amounted to only 3,750 miles.

The Demand for Carriage Facilities.

Imagine, if you can, what tremendous demands will have to be met by our carriers if the proportion of commercial and industrial increases is even fairly maintained. The figures run into sums almost too vast to be within human comprehension. **Think of** how much longer the lines, how much more numerous the **cars, and** how much more powerful the locomotives must be, **in twenty years** from now, when we shall have a population of more than 130,000,000, when our agricultural products will have vastly increased through the application of more advanced farming methods, when we have developed new lands, when manufacturing enterprises and their outputs will, in some cases, have trebled and quadrupled, when new lines will be opened and the old ones extended, when new industries will be created, and additional millions, many of them foreigners, settle now unoccupied and undeveloped portions of the land.

Considering the rate of increase in mileage, which has already taken place, it seems that what may appear to the uninitiated an excessive estimate was made by one great expert, who says that it will require a billion dollars a year for the next ten years to construct Rail Road facilities adequate to our wants at the end of that



period, while another well-known man estimates that $6,500,000,000 will be needed for new work for the decade.

Undeveloped Sections.

It is said that the state of Texas needs 10,000 miles of additional track to-day, and that this can and will be constructed under proper assurances of equitable treatment of the capital required. There are, unquestionably, other states that have relatively formidable needs. There are regions which cannot be developed properly without more transportation.

To Enable the Nation to Expand.

In eastern Montana, either Maine or Indiana, with its 36,360 square miles, could be set down and no Rail Road would touch it. In central Oregon our steam roads are just opening up a section in in which the great state of Ohio, with its 41,000 square miles, could be placed and not a Rail Road would touch it, or even New York, Rhode Island and the District of Columbia could be thrown into this great area, and not be touched by a rail. The whole Pacific Coast, from Mexico to Canada, has but a single north and south line, and there is only one other through north and south line west of the meridian of Minneapolis, in the vast expanse of territory to the Pacific Coast. The same thing may be said even of much of the border of the Mississippi Valley, while the Appalachian section of the East needs more mileage and the existing Eastern trunk lines need more tracks. The country is not developed, and much of the West, Northwest, Southwest and South have only fairly begun what will be their ultimate development.

The Risk of the Public.

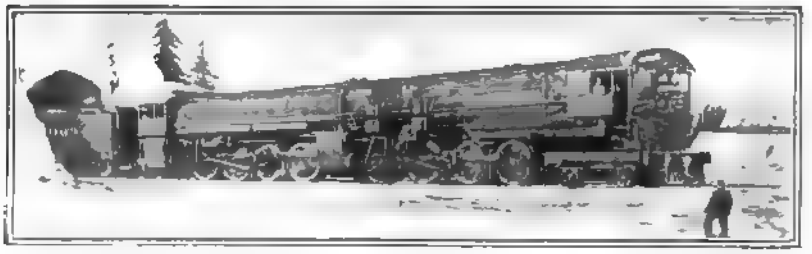
As we have facilities for building only a certain number of locomotives and cars, and turning out a certain mileage of rails each year, our steam carts and horses have to be provided long before they are needed, and extensions of our roads of rail have to be made far ahead.

A PROPOSED TURBINE LOCOMOTIVE.

Assuming, however, that by 1920 we have only doubled the tonnage handled as far back as 1907—in fact, it increased 100 per cent between 1899 and 1908—it would then be necessary for our Rail Roads to furnish approximately 5,000,000 freight cars for the proper handling of the 460,000,000,000 tons hauled for one mile, which it may reasonably be expected our products will amount to; 50 per cent additional facilities in the way of double tracks, side tracks, yards, stations and other appurtenances necessary for Rail Road operation will probably be required.

Future Traffic. In the next ten years at least 100 per cent more traffic must be handled than in the ten years which have gone by, or two tons for every ton now transported. The writer firmly believes that more nearly two and a quarter times what we now transport will be shipped ten years hence

There should be about 120,000 miles of new track to accomplish this, which would give us approximately 465,000 miles of track only ten years hence, and by 1930 the Rail Way tracks of the United States alone should equal the present line mileage of the world. There will not be so many new transcontinental Rail Roads built, but the most important Rail Roads of the future will have their freight tracks, on which no passenger train will run. This will enable them to give the constantly moving volume of our products an easy, freer flow through separate channels. Such a plan will greatly lessen the congestion, and therefore the proportion of accidents.



A [illegible] OF THE LOCOMOTIVE OF THE FUTURE

The greater freight lines will be generally of low grades, although there may be steep grade, electrified passenger lines for the purpose of saving time and distance

A Real Prophecy. In many places, where our Rail Roads are contiguous to or in great centers of population, thousands of miles of track will be elevated or depressed, to do away with the danger of grade crossings and the interference with and inconvenience to surface as well as to Rail Way traffic

Terminals of a Rail Way. One of the great Rail Road problems of the future is that of terminal facilities Their cost is bound to be greatly increased Realty in New York, Boston Philadelphia Baltimore, Chicago, St. Louis, Buffalo, Cleveland, New Orleans—in fact, in every city of the country—some-

times costs as much per square foot to-day as it cost per acre when the present terminal facilities were provided originally.

E Pluribus Unum.

The Japanese gave us a practical illustration of the truth of our national motto, when they showed that 1,000 pairs of human hands could drag up and over a mountain guns that later battered down the thitherto impregnable fortresses of Port Arthur. We have the commercial Gibraltars of other nations to storm. We can hardly succeed in gaining them by pulling separately or apart. Constructive and not destructive methods, and co-operation rather than contention should rule in the future.

A FULL TRAIN OF THE GRANITE IRON RAILWAY, THE FIRST RAILWAY IN AMERICA.

The progress and prosperity of the future are the problems of all, of every class, including the business man and the laborer. In fact, they are of moment to Everyman, Everywoman and Everychild of the nation.

The Source of Capital.

Enterprises and industries cannot expand without capital, and this must be provided from its only great source, the public. The great capitalists are really the people. No dollar, however, is so timid as that of the great body of the people in time of panic or unrest. We must not discourage the dollar from doing its duty in developing the country. Idle capital and industries spell idleness for the nation and a cessation of progress and prosperity. The capital of all the millionaires in the world would be exhausted as quickly as grass licked up by a prairie fire, if it alone were called upon to provide all the funds necessary for commercial and industrial expansion. We are prone to exaggerate fortunes these days. The man with one or two hundred thousand dollars is called a millionaire, and he with a million a multi-millionaire. We should not forget the fact that the average 155 families in the United States represent a million dollars.

Private Enterprises.

The people's money is willing to assist in the vitally essential upbuilding of our increasing requirements. It depends on us to encourage or discourage our neighbors to invest, for new investment means new business and added activities. They create for us national facilities, absolutely essential to our progress and prosperity.

THE IMPERATOR, THE LARGEST STEAMSHIP IN THE WORLD, 50,000 TONS

SECTION XLIV.

THE WORLD'S WORK.

What Share Shall We Have in the Growth of the World's Commerce, Progress and Prosperity?

It is of tremendous interest to note that the population of the world has doubled itself and then added 37 per cent to it in the past century, the 640,000,000 in 1810 growing to 1,520,000,000 in 1910. At this ratio, the world's population will be 3,678,000,000 in 2,010. It will be more, barring some great catastrophe, for the death rate of the world is being greatly reduced and will continue to be lessened.

The World's Commerce.

It is astounding to learn how greatly the business of the world has grown within little more than a century. For the year 1800 the entire world's international trade footed up to less than a billion and a half dollars—less than half the value of the annual exports and imports of the United States alone to-day

At present the world's international trade amounts to the stupendous total of over thirty billion dollars, having multiplied in one hundred and ten years more than twenty times. Even the present vast figures will be doubled again and again in the next fifty years. So stupendous a world business, together with its increase, is indeed worth getting a share of. Should we neglect it, we would be as improvident as if we sat as a nation and saw a golden flood roll by and diverted none of it.

The World's Store of Wealth.

Even greater has been the increase in the world's banking power, in a much shorter period. The world's banking power, as late as 1840, was only one-tenth that of the United States alone to-day, namely, $1,493,000,000, as against $45,347,000,000 in 1908, multiplying over thirty times in the short space of sixty-eight years, the total of 1840 being added practically every two years since. Its future increase will be astonishing.

Banking power does not mean the bankers' money; it is largely the people's money, deposited with the banks as trustees, for they have the right to withdraw it when they will. It shows how rapidly the wealth of the people of the world is growing. The per capita wealth of the white races will double and treble, if only we let well enough alone.

The Increase in General Wealth.

The increase in both these figures is particularly important, as showing a vast increase in business and general wealth. They are, therefore, of importance to all, for only in periods of brisk business can there be general prosperity, and only when the banking power is great—when there is an abundance of money and confidence—can the many enjoy the fullest prosperity.

Millions of Mouths to Feed and Backs to Clothe.

Few stop to realize that only 35 per cent of the world's population is Aryan, or white, and that nearly seven-tenths of the world's people are largely strangers to our comforts. We have found how, in the past, the savage has approved and appreciated many of the conveniences of the civilized man, as soon as introduced to him. Many of them he made haste to adopt, and even questionable luxuries, delights and satisfactions, such as drink, have been so enthusi-

Board of Trade, Berlin

Board of Trade, Lyons

astically seized upon by the savage, that they have become a curse to him.

The People's Desires. The palate, the desire for comforts, vanity and the desire for adornment, are the same the world over. For example, one of our consuls at an African port said that a few years ago the natives came from the interior to the seaport naked. They had little to spend. Gradually they acquired various articles of clothing, till now all are fully clothed and have acquired the means to spend freely for many articles which are products of civilized conditions.

A Vast World Commerce. How great the figures the world's statistician of to-morrow will deal with need not occupy us here; suffice it to say that they will be of astounding magnitude. The bringing of those parts of the earth still in semi-darkness to an enlightened state will obviously cause a demand to be met by a productive era on a scale that will almost sweep us off our feet, for there are to-day a billion people in the world who will want to be furnished with things now largely beyond their reach. For every person now a consumer there are about two waiting for a chance to get our goods, thus adding vastly to the world's consumption of manufactured articles.

It is undoubted that the middle of the twentieth century will witness an era of such general and expanded progress as will mean comforts for even those classes which are now struggling for the necessities, and pleasures and comforts for what are now semi and uncivilized peoples.

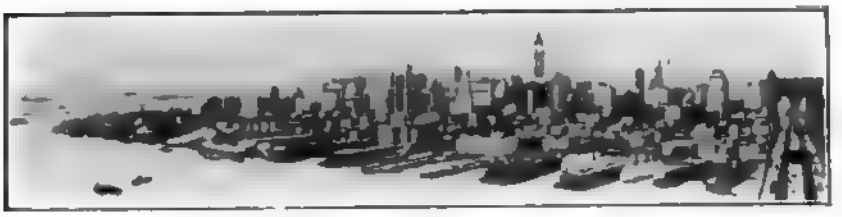
A New World. As we penetrate into this new old world, we will find new mouths to feed and backs to clothe, and demands that will make the whole world a great ant-hill of industry, such as has never been dreamed of. Figuratively, Europe, with its teeming millions, is to be copper-wired, trolleyed, railed, implemented, bath-tubbed and sanitarily plumbed —in short, brought to a parity with America for the maximum of human convenience and comfort.

An Example of the Awakening of the World.

The most remote districts of the Orient and Africa are to be reached. The great slumbering yellow dragon is already beginning to awaken, and his 25 per cent of the world's population, heretofore largely strangers to and non-consumers of the products of advanced civilization, will be clamoring for many of our foodstuffs and wares. A representative government for China is indicative of other changes to come. China made greater progress between 1900 and 1910 than in the preceding ten centuries. The more serious problem now is not to keep her moving, but to keep her from moving too rapidly.

A Great Factor. The query is how her awakening will affect the United States and the rest of the world. Her four hundred million people, as they will be brought into the sphere and full current of the world's activities, will exercise a

profound influence on commercial and social conditions. The other countries of the world should grasp the opportunities afforded by the period of flux and change, to help mold this new force in world affairs.



Lower New York from the East River.

The telegraph already reaches remotest Cathay. And the telephone now summons the Grand Council of the Dragon Empire to the Royal Palace, while Rail Road and street car bring its members from distant points and near. She has awakened to the necessity of Steam Roads, and tens of thousands of miles of them will be built.

Educational Progress.

The Chinese boy of old mechanically learned a thousand characters before he learned their meaning. That form of education slavishly trained memory rather than reason. The old education made him capable of framing empty sentences of exquisite sound. The new education gives him a working knowledge of the world and of the work which he must do to best fill his place therein.

The millions of men of darker hue, wherever they may be, in India, Java, the Malay Peninsula, Cochin-China, Australia, North Africa, the South Sea Islands, are some day to become important factors, and great consumers of the world's goods; and the shrill whistle already has awakened the black man from his long and undisturbed commercial lethargy. The Africa of the future, as white men penetrate it and develop it and its people, is destined to become one of the consuming wonders of the world; while, as we have said elsewhere, South America is but a child in arms commercially compared with what it will soon become.

An Illustration.

It has been said that to-morrow the traveling salesman will sell American ice machines throughout Asia and Africa. This is a fancy which in a broader sense is destined to become a fact.

Such is the outlook! Does not the realization of such progress and prosperity depend to a great extent upon giving proper power to the arms which force open the closed doors of commerce, and upon giving strength to the back and speed to the legs of the common carriers which swiftly bear the burdens of the world?

Modern Primitive Methods.

In a recent number of the National Geographical Magazine was a picture of African women each carrying about a bushel of maize on her head, which they had, in some cases, thus carried for two or three days' journey to a seaport market, selling it for a couple of

shillings and spending the money received before returning. What could speak more clearly the human desire for trade, what more pitifully for human burden-bearing? In the interior of China, and even in Canton human beings do the bearing of burdens, and men are to be found with backs and shoulders galled and calloused like the backs and shoulders of draft animals and beasts of burden.

The use of the horse of steam is more humane than the exploitation of human or animal strength. Above all, it is cheapest, and enables man to devote his time and strength to production, instead of using up a great part of his time in wasted and burdensome effort.

Of Interest to All.

We are interested in every tie laid and every foot of steel that goes down in any part of the world, in every good road built, in every river and stream navigated. Let us start a great, world-wide good roads movement. We shall see its results marked in everything that tends to additional progress and prosperity.

LAKE FROST, CHICAGO.

Man's Achievements the Greatest Romance of the World.

What the Author Has Learned.

In his years of work in preparing this story of progress and prosperity, the writer has been startled in realizing what colossal strides have been made in the modern era.

The advance, at first so slow as to be almost imperceptible, has proceeded, gathering ever accelerated velocity, achieving so much in age after age that what has been gained has made the fiction and fancy of one age the fact of the next. The writer has been surprised at the numerous refreshing incidents

which have come to light, and how little known are many most salient facts of the greatest economic and educational value, scarcely less than an education itself. He has come to feel that the real and condensed story of the progress and prosperity of the human race, as written by man's achievements, contains few dull pages or paragraphs, and is, in fact, the greatest, most fascinating and readable romance in the world.

Essential Knowledge.

As the general in command of an army, so in the battle of the world the individual must know his resources, environment and adversaries, successfully to plan his own campaign. The facts of the past, the conditions of the present and the probabilities of the future are the guiding lights in steering ourselves and the nation to a progressive and prosperous to-morrow.

If this work stimulates interest in the problems of progress and prosperity, and sets men to thinking upon these questions, the writer will have achieved his highest aim.

Concentrated Thought.

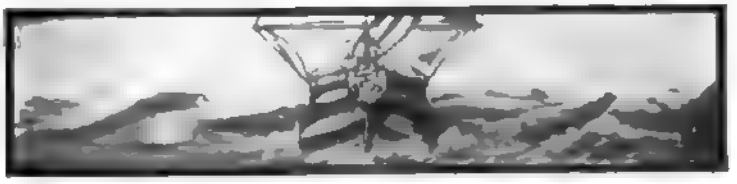
It is only when a nation concentrates itself on a given question, and when many minds are centered upon it, that great things are achieved and permanent good results.

The writer has endeavored to avoid any expression of his personal views and opinions, and desires every reader to think for himself. In reciting the story of progress and prosperity, we have not told the story of the dollar alone. Progress is not only material, but religious, intellectual, political, social and moral.

Practical Altruism.

Progress has as many facets as a diamond. Nor can progress and prosperity exist for the individual alone. President Lowell, of Harvard, recently said in this connection: "We are not our own property. No man in our commonwealth lives or dies for himself. He lives or dies for the fellowmen who are with him in the community." Consequently, it is our duty, not only to work for the development of our own progress and prosperity to the highest possible point, financial, intellectual, moral and physical, but to see to it that each of us does something of worth for the betterment of the world.

It does seem that this is the best world that man has yet known, and growing better day by day, made so by ever new triumphs and achievements in PROGRESS AND PROSPERITY.



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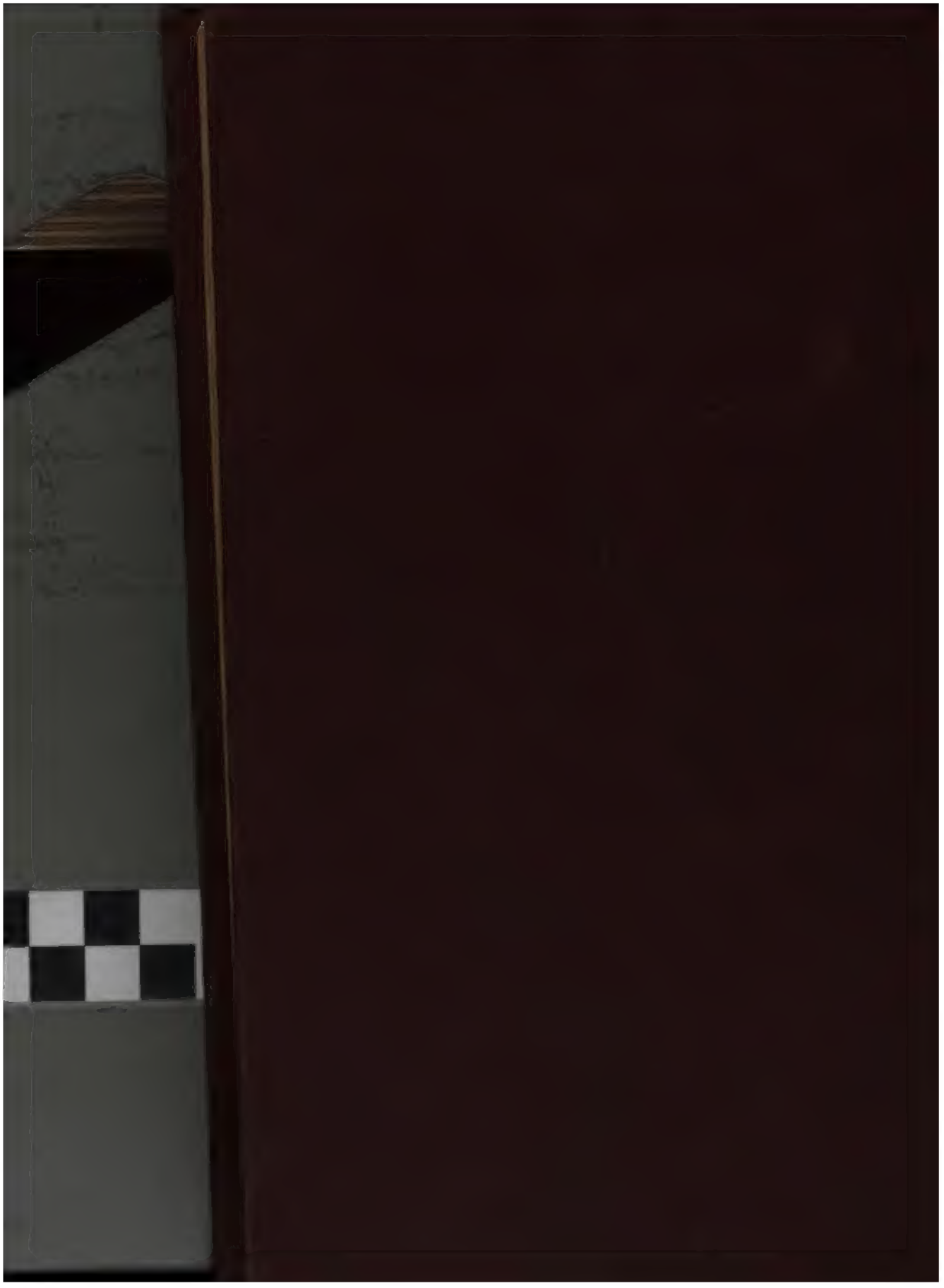
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